BANG & OLUFSEN A/S
DK - 7600 STRUER
DENMARK

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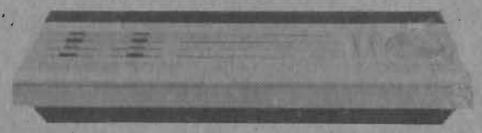
Form. 7208

Bang & Olufsen



BEOMASTER 2000

TYPE 2801

SERVICE MANUAL

CONTENTS SECTION

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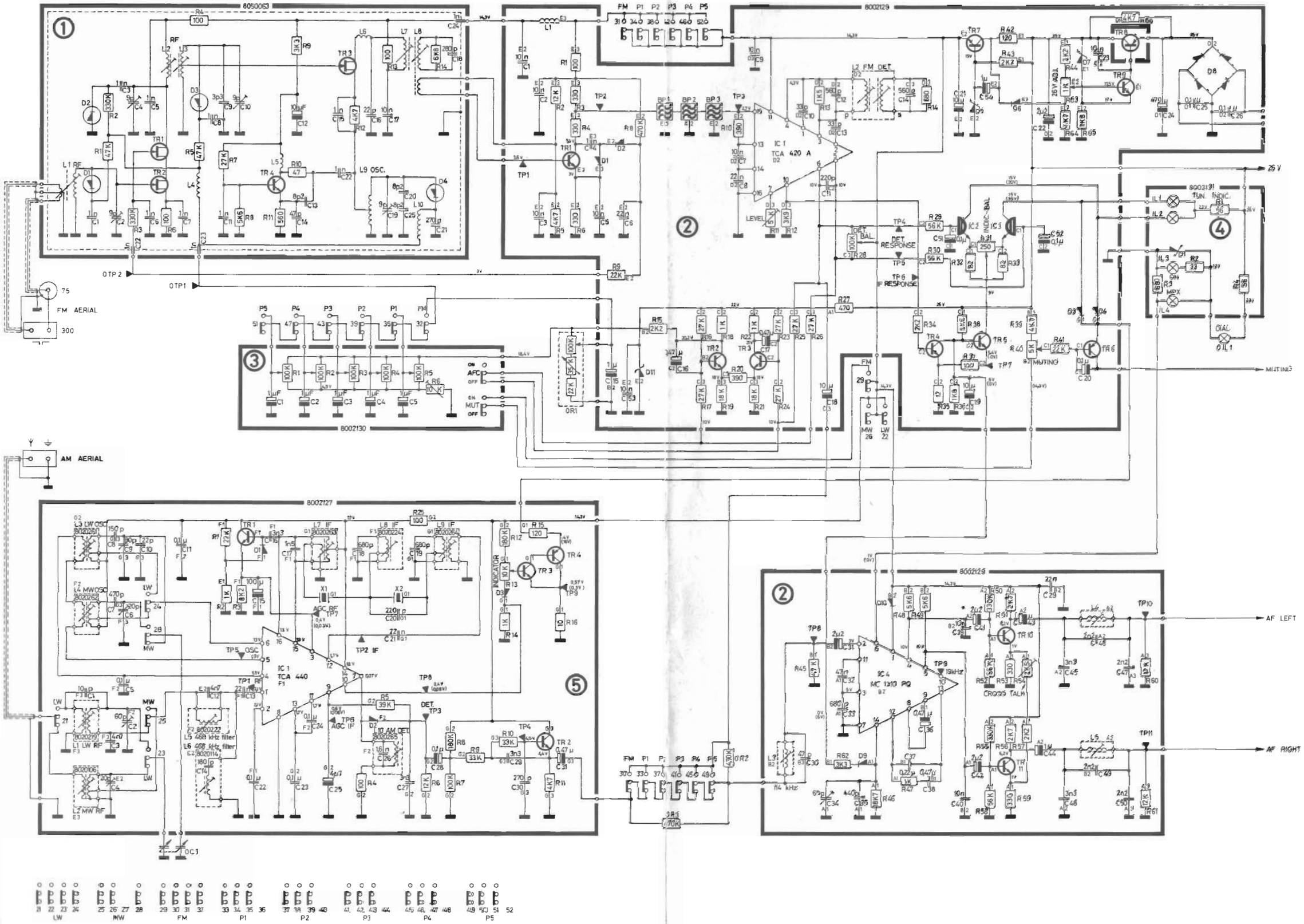
Diagrammes, PC boards, transistor list and diodes 2
Electrical parts list 3
Functional description 4
Adjustments 5
Mechanical parts list 6
Mounting of dial cord 7
Modifications 8

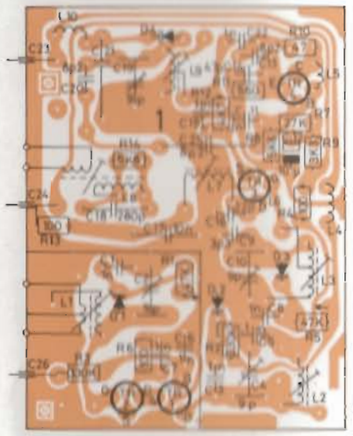
Bang & Olufsen

TECHNICAL DATA	BEOMASTER 2000, type 2801	DIN 45 500 REQUIREMENTS
Amplifier		
Power output at specified		
distortion 1000 Hz RMS	2 x 40 watts / 4 Ohms	2 x 6 watt
	2 x 30 watts / 8 Ohms	
Music power	2 x 75 watts / 4 Ohms	
	2 x 40 watts / 8 Ohms	
Speaker impedance	4 ohms	4 or 8 Ohms
Harmonic distortion		
1000 Hz 50 mW DIN 45 500	< 0,06%	
1000 Hz at stated output	< 0,1%	≤ 1%
Intermodulation DIN 45 500	< 0,25%	≤ 3%
Frequency range ± 1,5 dB DIN 45 500	20 - 30.000 Hz	40 - 16.000 Hz
Power bandwidth DIN 45 500	10 - 40.000 Hz	40 - 12.500 Hz
Damping factor 1000 Hz DIN 45 500	> 45	≥ 3
Input pick-up, low impedance	2,5 mV / 47 KOhms	≤ 5 mV / 47 KOhm
2 channel high impedance	175 mV / 1 MOhms	≤ 500 mV / 470 KOhm
Signal-to-noise ratio DIN 45 500		
50 mW, pick-up, low impedance	≥ 60 dB	≥ 47 dB
50 mW high impedance	≥ 60 dB	≥ 47 dB
Channel separation 1000 Hz DIN 45 500	≥ 56 dB	≥ 40 dB
250 - 10.000 Hz	≥ 40 dB	≥ 26 dB
Output tape recorder 1000 Hz DIN 45 500	15 mV / 20 KOhms	0,1 - 2 mV / KOhm
Headphones	Max. 8 V / 200 Ohms	
Bass control at 40 Hz	± 17 dB	
Treble control at 12.500 Hz	± 15 dB	
FM tuner		
Range	87,5 - 104 MHz	
Sensitivity 26 dB ± 40 kHz	< 1,5 µV / 75 Ohms	
Sensitivity IHF	< 2 µV / 75 Ohms	
Limiting −3 dB ± 40 kHz	< 1 µV / 75 Ohms	
Signal-to-noise ratio DIN 45 500	> 65 dB	≥ 47 dB
Selectivity IHF	> 62 dB	
Frequency range ± 1,5 dB DIN 45 500	20 - 15.000 Hz	40 - 12.500 Hz
Harmonic distortion DIN 45 500	< 0,4%	≤ 2,5%
Stereo channel separation DIN 45 500	≥ 35 dB	≥ 22 dB
Pilot suppression 19 kHz	≥ 48 dB	≥ 25 dB
38 kHz	≥ 35 dB	≥ 31 dB
AM tuner		
LW	147 - 350 kHz	
MW	520 - 1605 kHz	
Sensitivity 20 dB LW 200 kHz	85 µV	
MW 1000 kHz	35 µV	
Bandwidth 3 dB	6,8 kHz	
Other data		
Power supply	110-130-220-240 V	
Power consumption	20 - 250 watts	
Dimensions W x H x D	68,5 x 7,5 x 27 cm	
Weight	8,2 kg	

Subject to change without notice


8050093
8002129
8002130
8002127
FM P1 P2 P3 P4 P5
310 340 380 420 460 520
RF
IC 1 TCA 420 A
IC 1 TCA 440
IC 4 MC 1310 P2
L1 RF
L2 FM DET
L3 LW OSC
L4 MW OSC
L5 468 kHz filter
L6 468 kHz filter
L7 IF
L8 IF
L9 IF
L9 OSC.
L10
TP1
TP2
TP2 IF
TP3
TP4
TP5
TP5 OSC
TP6
TP6 IF RESPONSE
TP7
TP8
TP9
TP10
TP11
TR1
TR2
TR3
TR4
TR5
TR6
TR7
TR8
TR9
TR10
TR11
TR 2
D1
D2
D3
D4
D7
D8
D9
D11
D12
D13
D14
D15
D16
D17
D18
D19
D20
D21
D22
D23
D24
D25
D26
D27
D28
D29
D30
D31
D32
D33
D34
D35
D36
D37
D38
D39
D40
D41
D42
D43
D44
D45
D46
D47
D48
D49
D50

1 FRONT END
8050063



2 IF SECTION AND DECODER
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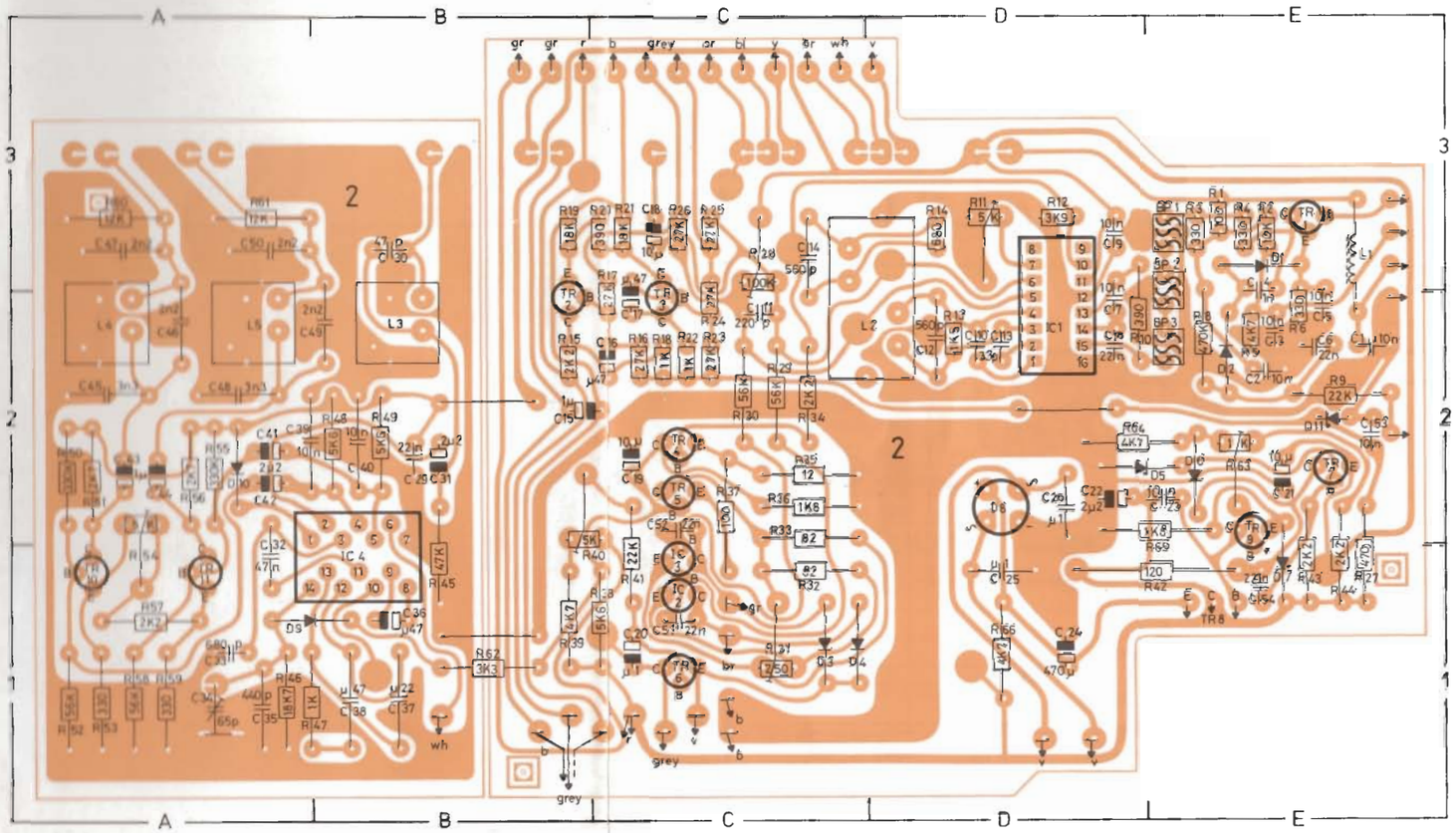
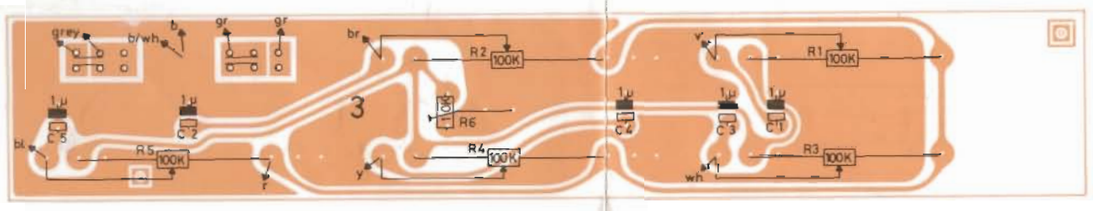


3 PRE-SET TUNING
8002130



4 INDICATOR CIRCUIT
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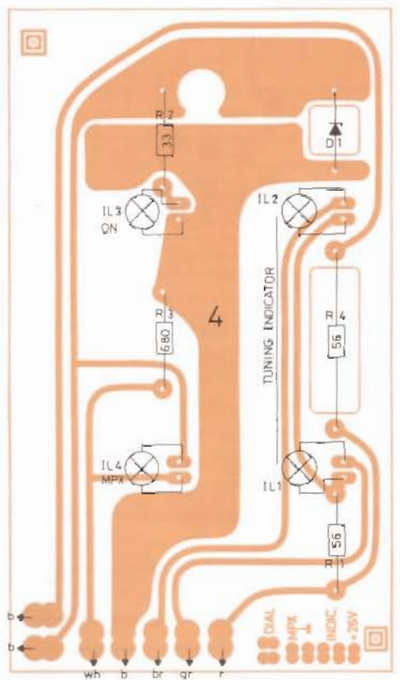
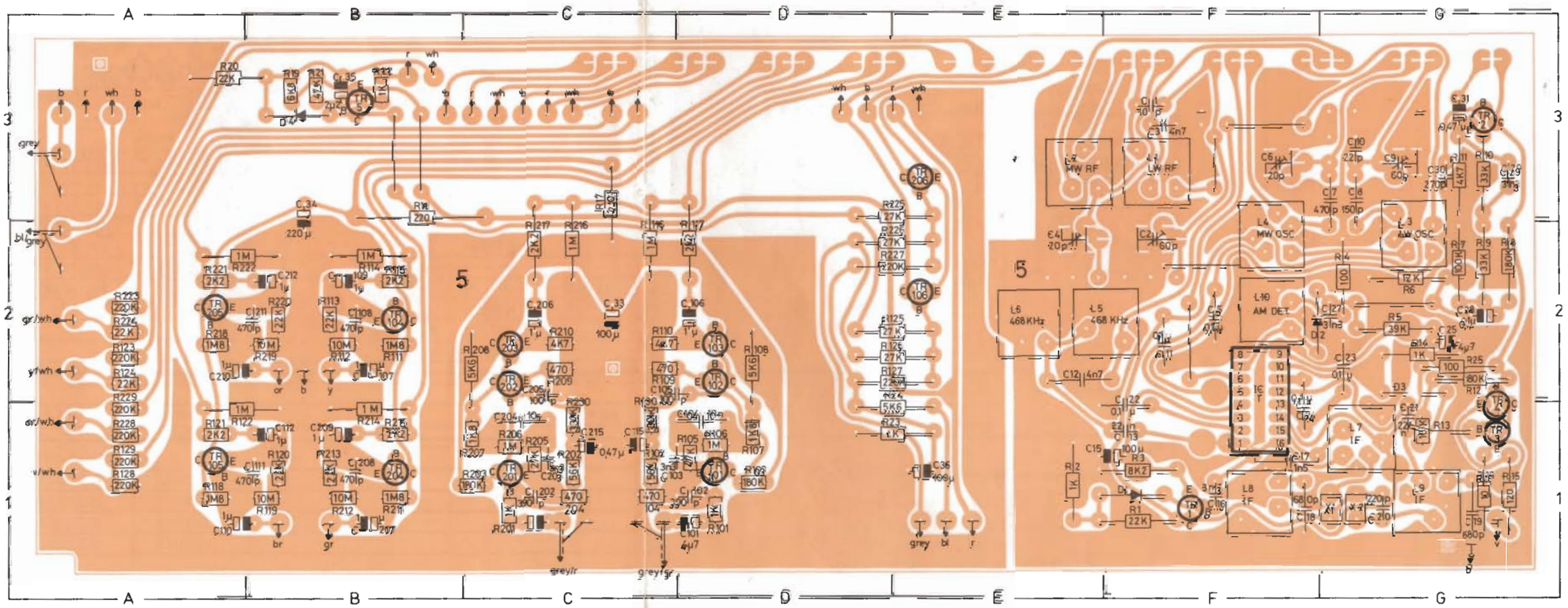
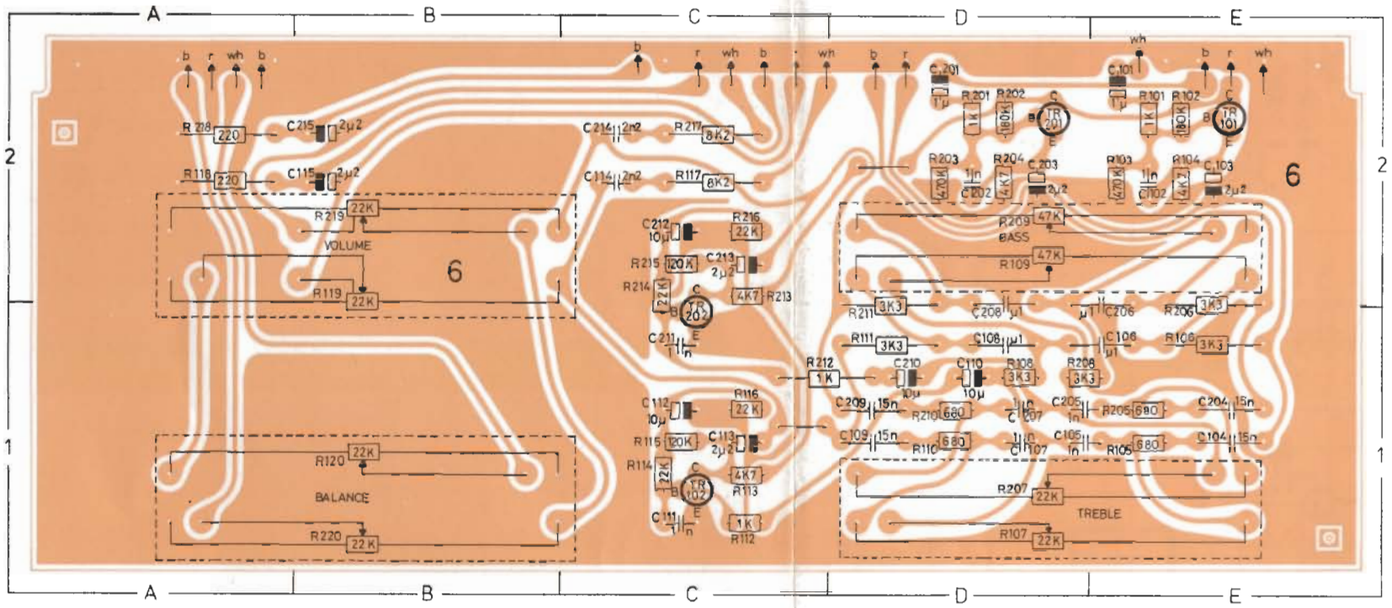


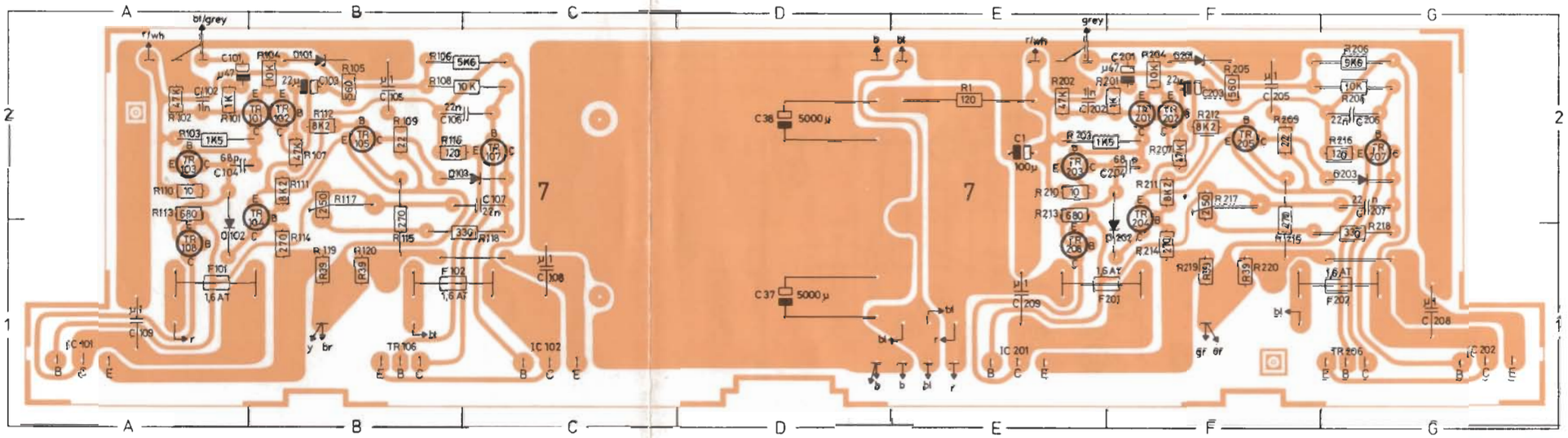
5 AM - IF SECTION
AND PREAMPLIFIER
8002127


A
B
C
D
E
F
G
1
2
3
5
R20 22K
C34 220µ
R116 220
R117 2K2
C33 100µ
C36 4µ7
R221 2K2
R222 1M
R220 22K
C211 470p
R218 1M8
R219 10M
C210 1µ
R223 220K
R224 22K
R123 220K
R124 22K
R229 220K
R228 220K
R129 220K
R128 220K
R121 2K2
R122 1M
C112 1µ
R120 22K
C111 470p
R118 1M8
R119 10M
C110 1µ
R113 22K
C108 470p
R112 10M
C107 1µ
R114 2K2
R115 1M
C109 1µ
R213 2K2
C208 470p
R212 10M
R211 1M8
C207 1µ
R206 1M
R205 27K
C205 10µ
C204 10µ
R207 180K
R208 5K6
C206 1µ
R210 4K7
R209 470
C203 100p
R202 150K
C202 100p
C201 100p
R201 1K
C101 4µ7
R110 4K7
R109 470
C105 100p
R230 150K
C106 100p
C102 100p
R101 1K
R108 5K6
R107 180K
C103 3n3
C104 100p
C215 0,47µ
R225 27K
R226 27K
R227 220K
R125 27K
R126 27K
R127 220K
R124 5K6
R123 1K
C35 4n7
L8 MW RF
L1 LW RF
C1 10p
C31 4n7
C6 20p
C4 20p
C2 60p
L4 MW OSC.
L3 LW OSC.
C17 470p
C18 150p
C19 221p
C9 60p
C30 270p
C29 4n7
C31 0,47µ
R10 33K
R9 33K
R7 180K
R8 180K
R6 12K
R5 39K
R14 1K
R25 100
R12 180K
R24 100
L10 AM DET.
C27 3n3
D2
C28 0,1µ
C25 4µ7
C23 0,1µ
D3
C22 0,1µ
C21 22p
R13 12K
C24 0,1µ
C26 0,1µ
C32 0,1µ
L6 468 KHz
L5 468 KHz
C12 4n7
C13 0,1µ
C14 0,1µ
C15 100µ
R3 8K2
R2 1K
D4
R1 22K
C16 3n3
L7 IF
L8 IF
L9 IF
C117 1n5
C118 68p
C119 220p
C120 680p
X1
R15 50
R16 120
C121 0,1µ
C122 0,1µ
C123 0,1µ
C124 0,1µ
C125 0,1µ
C126 0,1µ
C127 0,1µ
C128 0,1µ
C129 0,1µ
C130 0,1µ
C131 0,1µ
C132 0,1µ
C133 0,1µ
C134 0,1µ
C135 0,1µ
C136 0,1µ
C137 0,1µ
C138 0,1µ
C139 0,1µ
C140 0,1µ

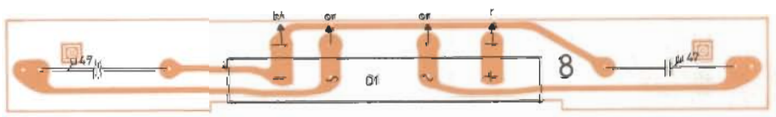
6 TONE AMPLIFIER
8002126



7 OUTPUT AMPLIFIER
8002125



8 POWER SUPPLY
8002123



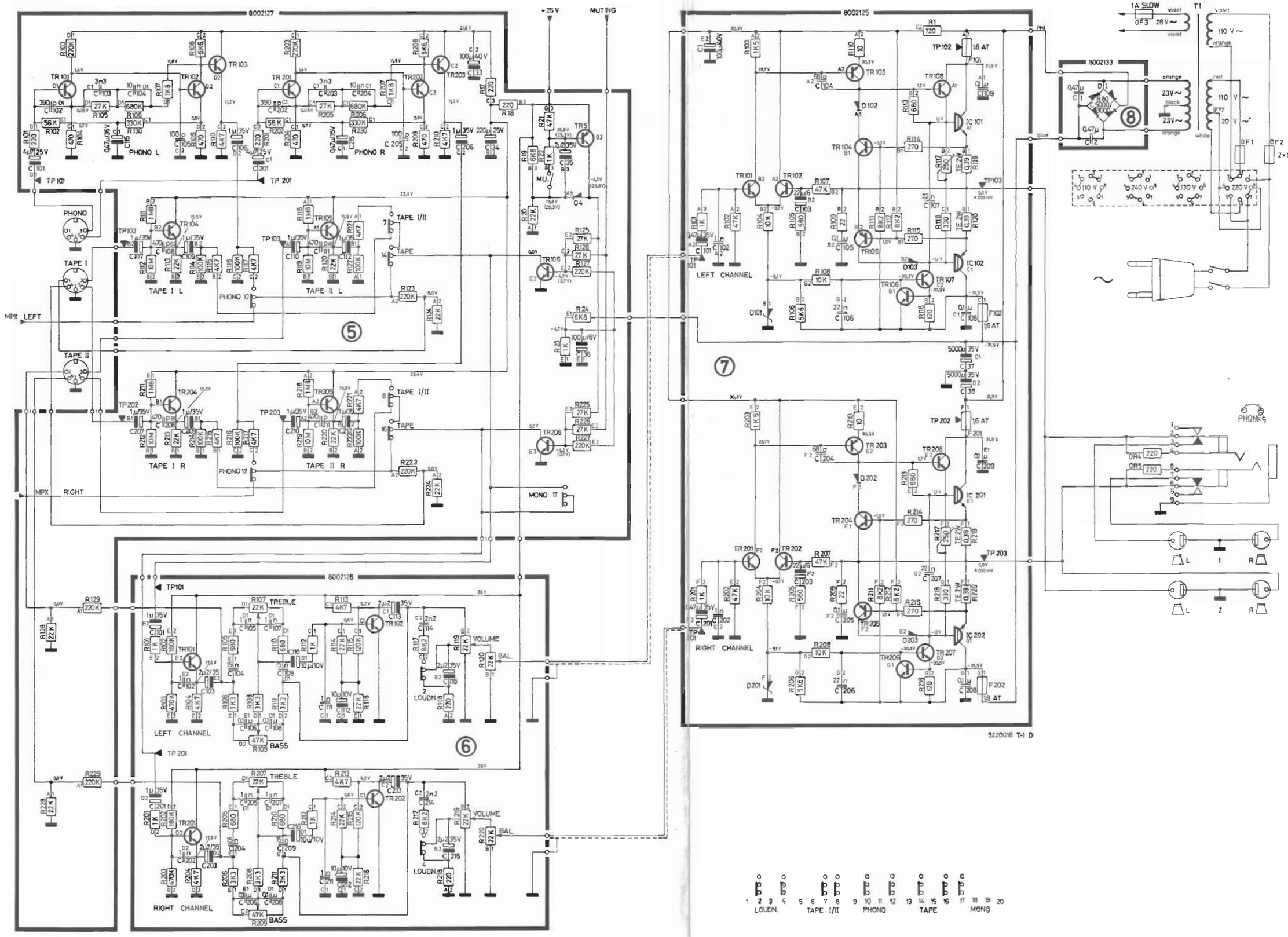
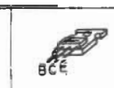
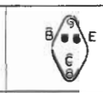
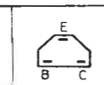
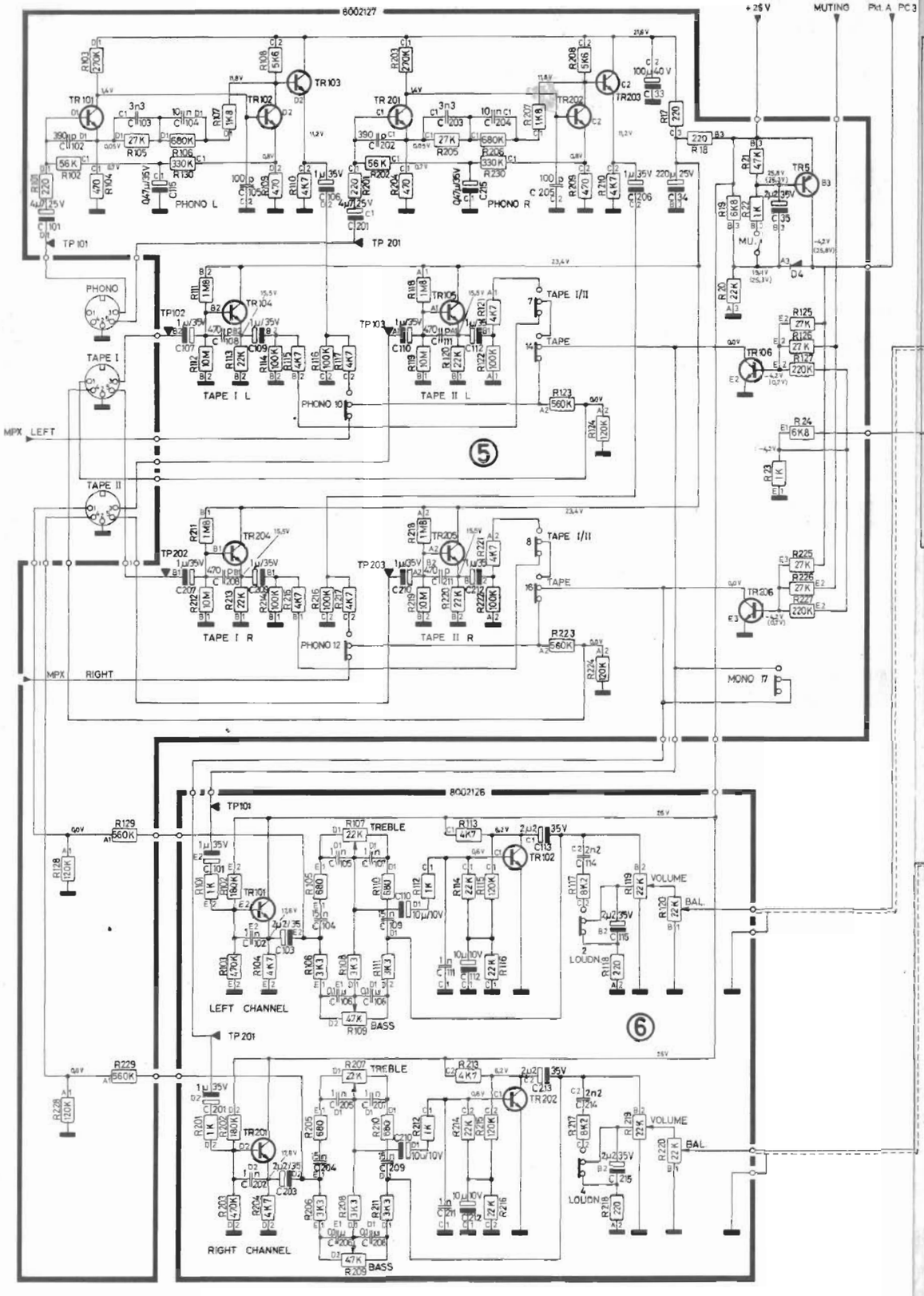
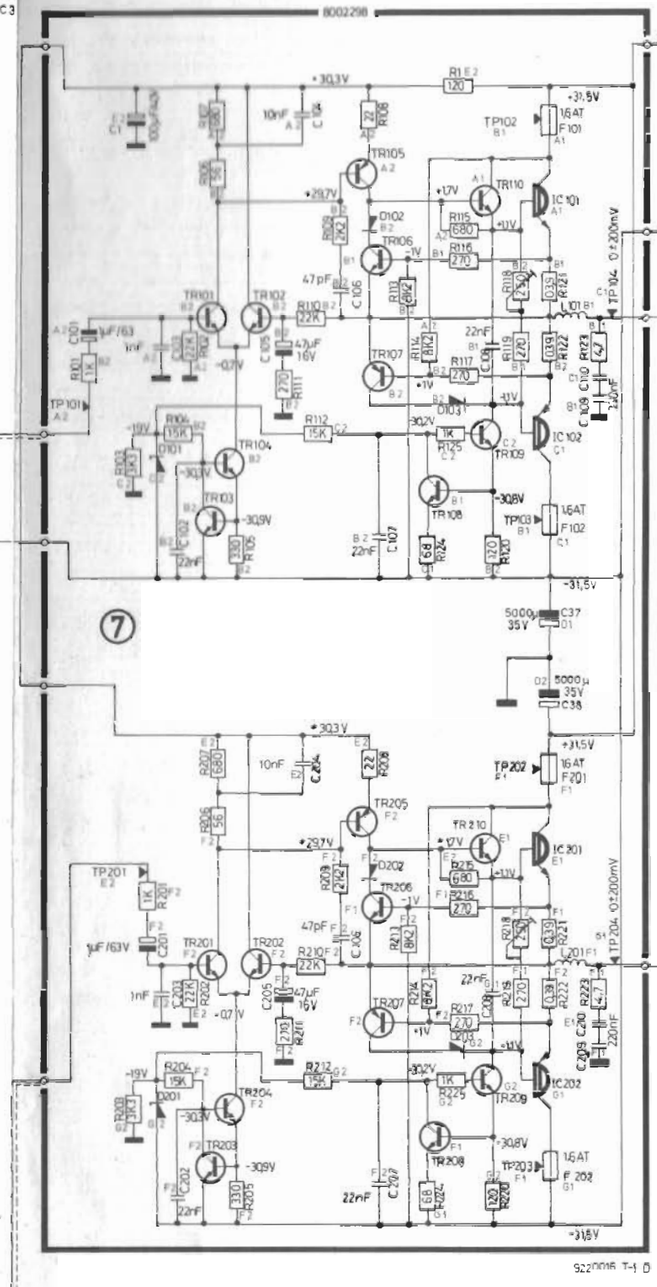

8002127
8002125
8002126
8002133
+25 V
MUTING
PHONO L
PHONO R
TAPE I/II
TAPE
PHONO 10
PHONO 12
MONO 17
MPX LEFT
MPX RIGHT
TAPE I
TAPE II
TAPE I L
TAPE II L
TAPE I R
TAPE II R
LEFT CHANNEL
RIGHT CHANNEL
TREBLE
VOLUME
BAL.
LOUDN.
BASS
1A SLOW
T1
110 V ~
23V~
2x1 AMP SLOW
PHONES
LOUDN.
TAPE I/II
PHONO
TAPE
MONO
9220016 T-1 D

Diagram 2

TRANSISTOR CHART

														
1TR1	8320119							TIS 88		U1981E				
1TR2								2N5243						
1TR3	8320136							TIS 88	3C2P	U1981E				
								2N5245						
								3C2						
1TR4	8320112													BF195
2TR1	8320311	BF240												
2TR2	8320285			BC183CK	BC183CL									
2TR3														
2TR4	8320200		MPS6515	BC182BK	BC182BL									
2TR5				BC237B										
2TR6	8320152			BC212BK	BC212BL	BC261B								
				BC251B										
2TR7	8320323		MPS A05											
2TR8	8320240												BD136	
2TR9	8320200		MPS6515	BC182BK	BC182BL									
2TR10				BC237B										
2TR11														
2IC2	8340028		MPS A13											
2IC3			SPS5418											
5TR1	8320108		MPS6515	BC238B	BC183BL	BC108B	BC113							
5TR2				BC548B			BC114							
5TR3				BC183BK										
5TR4	8320324		MPS A55											
5TR5	8320161			BC212BK	BC212BL	BC261B								
				BC251B										
5TR101/201	8320344			BC384BK	BC384BL									
5TR102/202				BC550B										
5TR103/203	8320097		BC317B	BC547B	BC182BL		BC207B							
				BC237B										
				BC171B										
				BC182BK										
5TR104/204	8320095		BC319B	BC173B	BC184BL	BC109B								
5TR105/205				BC549B										
				BC239B										
				BC184BK										
5TR106/206	8320138			BC183BK	BC183BL									
6TR101/201	8320097		BC317B	BC547B	BC182BL		BC207B							
6TR102/202				BC237B										
7TR101/201				BC171B										
7TR102/202				BC182BK										
7TR103/203	8320322		MPS A56											
7TR104/204	8320097		BC317B	BC547B	BC182BL		BC207B							
				BC237B										
				BC171B										
				BC182BK										
7TR105/205	8320161			BC212BK	BC212BL	BC261B								
				BC251B										
7TR106/206	8320138			BC183BK	BC183BL									
7TR107/207	8320321		MPS A06											
7TR108/208														
7IC101/201	8340042										TIP141			
7IC101/201	8340030											MJ3001		
7IC102/202	8340041										TIP146			
7IC102/202	8340019											MJ2501		


8002127
+26 V
MUTING
Pkt. A. PC 3
TR 101
TR 102
TR 103
TR 201
TR 202
TR 203
TR5
PHONO L
PHONO R
TP 101
TP 201
PHONO
TAPE I
TAPE II
TAPE I L
TAPE II L
TAPE I R
TAPE II R
PHONO 10
PHONO 12
TAPE I/II
TAPE
MONO 17
MPX LEFT
MPX RIGHT
TR104
TR105
TR106
TR204
TR205
TR206
5
8002126
TP101
TP201
TREBLE
BASS
VOLUME
BAL.
LOUDN.
LEFT CHANNEL
RIGHT CHANNEL
TR101
TR102
TR201
TR202
6


8002298
+30,3V
+31,5V
TP102
TP104
TP101
TP103
TP202
TP201
TP204
TR105
TR110
TR101
TR102
TR106
TR107
TR104
TR103
TR108
TR109
TR205
TR210
TR206
TR201
TR202
TR207
TR204
TR203
TR208
TR209
IC 101
IC 102
IC 301
IC 201
IC 202
F101
F102
F201
F202
7
-31,5V
+31,5V
-30,8V
+30,3V
-29,7V
-30,9V
+29,7V
-30,2V
+30,2V
-31,8V
+29,2V
-29,8V
+31,8V
-30,3V
+30,8V
-30,4V
+30,4V
-31,2V
+31,2V
-30,7V
+30,7V
-31,0V
+31,0V
-30,9V
+30,9V
-31,1V
+31,1V
-30,5V
+30,5V
-31,3V
+31,3V
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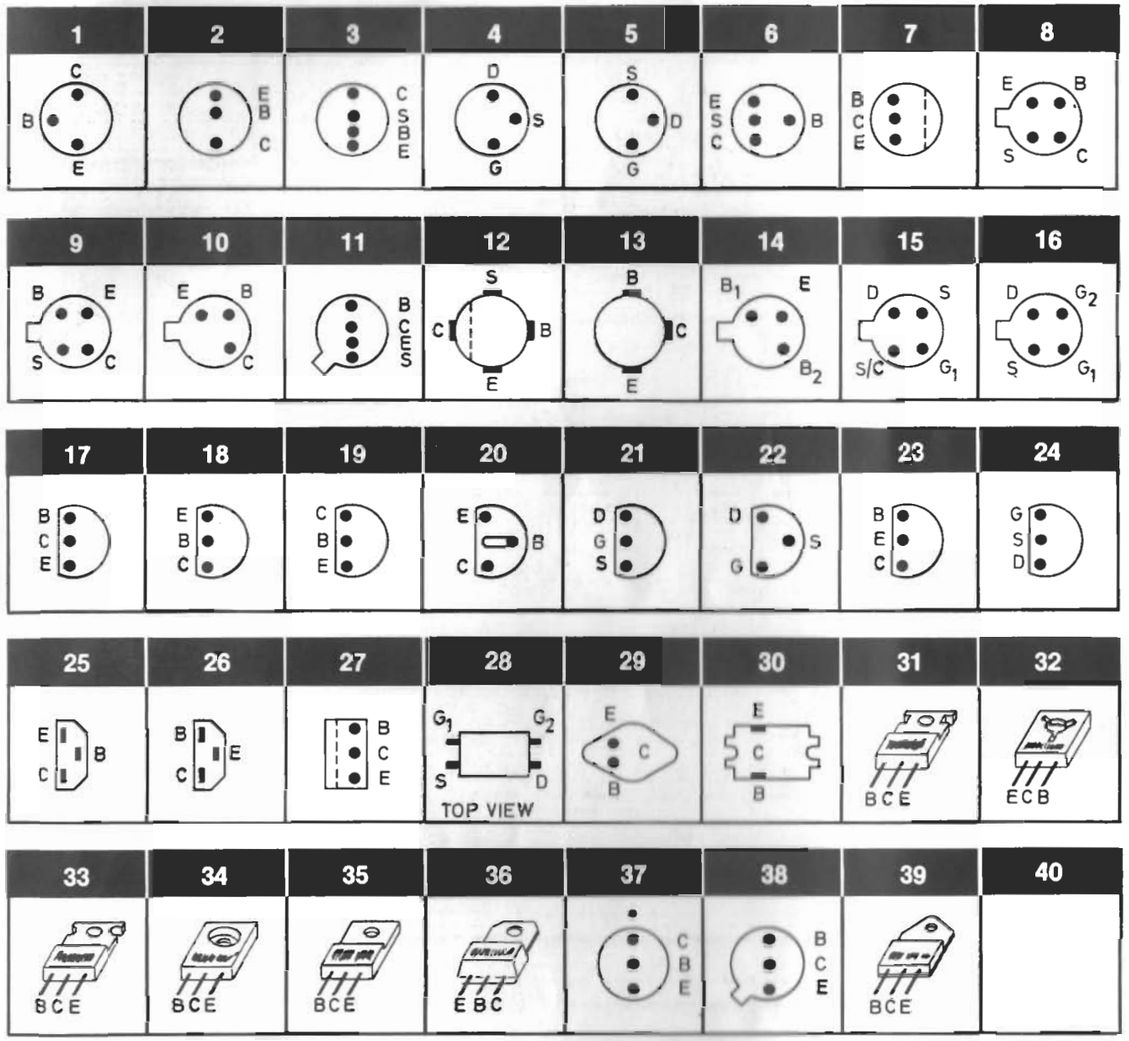
+30,6V
-31,4V
+31,4V
-31,5V
+31,5V
-31,6V
+31,6V
-31,7V
+31,7V
-31,8V
+31,8V
-31,9V
+31,9V
-32,0V
+32,0V
-32,1V
+32,1V
-32,2V
+32,2V
-32,3V
+32,3V
-32,4V
+32,4V
-32,5V
+32,5V
-32,6V
+32,6V
-32,7V
+32,7V
-32,8V
+32,8V
-32,9V
+32,9V
-33,0V
+33,0V
-33,1V
+33,1V
-33,2V
+33,2V
-33,3V
+33,3V
-33,4V
+33,4V
-33,5V
+33,5V
-33,6V
+33,6V
-33,7V
+33,7V
-33,8V
+33,8V
-33,9V
+33,9V
-34,0V
+34,0V
-34,1V
+34,1V
-34,2V
+34,2V
-34,3V
+34,3V

TRANSISTOR AND IC LIST

1TR1	8320119	4	U 1981 E
1TR2		21	2N 5245
		21	TIS 88 A
1TR3	8320136	4	U 1981 E
		5	U 1837 E
		21	2N 5245
		21	3 C 2
		22	3 C 2 P
		21	TIS 88 A
1TR4	8320112	26	BF 195
2TR1	8320311	23	BF 240
2TR2	8320285	20	BC 183 C
2TR3		20	BC 183 CK
		17	BC 183 CL
2TR4	8320200	19	MPS 6515
2TR5		20	BC 182 B
		20	BC 182 BK
		17	BC 182 BL
		18	BC 237 B
		20	BC 171 B
2TR6	8320152	20	BC 212 B
		20	BC 212 BK
		17	BC 212 BL
		10	BC 261 B
		20	BC 251 B
		18	BC 307 B
2TR7	8320323	19	MPS A05
2TR8	8320240	32	BD 136
		32	BD 136 W
2TR9	8320200	19	MPS 6515
2TR10		20	BC 182 B
2TR11		20	BC 182 BK
		17	BC 182 BL
		18	BC 237 B
		20	BC 171 B
2IC1	8340033		TCA 420 A
2IC2	8340028	19	MPS A13
2IC3		19	SPS 5418
2IC4	8340032		MC 1310 Q
			CA 3010 Q

3TR1	8320119	4	U 1981 E
		21	2N 5245
		21	TIS 88 A
5TR1	8320108	10	BC 108 B
5TR2		1	BC 113
5TR3		18	BC 238 B
		20	BC 548 B
		20	BC 183 B
		17	BC 183 BL
		20	BC 183 BK
		19	MPS 6515
		1	BC 114
		20	BC 172 B
5TR4	8320324	19	MPS A55
5TR5	8320161	20	BC 212 B
		20	BC 212 BK
		17	BC 212 BL
		20	BC 251 B
5TR101/201	8320344	20	BC 384 B
5TR102/202		20	BC 384 BK
		17	BC 384 BL
		20	BC 550 B
5TR103/203	8320097	20	BC 547 B
		18	BC 237 B
		20	BC 171 B
		19	BC 317 B
		20	BC 182 B
		20	BC 182 BK
		17	BC 182 BL
		1	BC 207 B
5TR104/204	8320095	20	BC 549 B
5TR105/205		20	BC 184 B
		17	BC 184 BL
		20	BC 184 BK
5TR106/206	8320366	19	MPS A16
5IC1	8340031		TCA 440
6TR101/201	8320097	20	BC 547 B
6TR102/202		18	BC 237 B
		20	BC 171 B
		19	BC 317 B
		20	BC 182 B
		20	BC 182 BK
		17	BC 182 BL
		1	BC 207 B

7TR101/201	8320377	20	BC 547 B
7TR102/202		20	BC 182 B
		20	BC 182 BK
		17	BC 182 BL
7TR103/203	8320097	20	BC 547 B
7TR104/204		18	BC 237 B
		20	BC 171 B
		19	BC 317 B
		20	BC 182 B
		20	BC 182 BK
		17	BC 182 BL
		1	BC 207 B
7TR105/205	8320365	19	MPS H54
7TR106/206	8320097	20	BC 547 B
		18	BC 237 B
		20	BC 171 B
		19	BC 317 B
		20	BC 182 B
		20	BC 182 BK
		17	BC 182 BL
		1	BC 207 B
7TR107/207	8320161	20	BC 212 B
		20	BC 212 BK
		17	BC 212 BL
		20	BC 550 B
7TR108/208	8320138	20	BC 183 B
		20	BC 183 BK
		17	BC 183 BL
7TR109/209	8320321	19	MPS A06
7TR110/210			
7IC101/201	8340042	39	TIP 141
	8340030	29	MJ 3001
7IC102/202	8340041	39	TIP 146
	8340029	29	MJ 2501



DIODE LIST

1D1	8300050	BB 103 blue
1D2-1D3	8300041	BB 103 green
1D4	8300050	BB 103 blue
2D1-2D4	8300058	SFD 184
		1N 4148
2D5	8300053	ZPD 15V
		BZX 79 15V
		BZY 88
2D6	8300058	SFD 184
		1N 4148
2D7	8300028	ZPD 9,1V
		BZX 79 9,1V
2D8	8300155	B 40 C 800
2D9-2D10	8300058	SFD 184
		1N 4148
2D11	8340059	22V reg.
2D12	8300058	SFD 184
		1N 4148

4D1	8300034	ZY 12
		LMZ 12
5D1	8300058	SFD 184
		1N 4148
5D2	8300024	AA 119
5D3-5D4	8300058	SFD 184
		1 N 4148
7D101/201	8300029	ZPD 12V 5%
		BZX 79 12V
7D102/202	8300058	SFD 184
7D103/203		1N 4148

DIODE AND IC C

Colour of wires
Kabelfarben
Ledningsfarver

DIODE AND IC CHART

1D1	8300050	BB 103 blue		
1D2 - 1D3	8300041	BB 103 green		
1D4	8300050	BB 103 blue		
2D1 - 2D4	8300058	SFD 184	1N4148	
2D5	8300053	ZPD 15V	BZX 79 15V	BZY 88
2D6	8300058	SFD 184	1N4148	
2D7	8300028	ZPD 9V1	BZX 79 9V1	
2D8	8300155	B40C800		
2D9 - 2D10	8300058	SFD 184	1N4148	
2D11	8340059	ZTK 22		
4D1	8300034	ZY 12	LMZ 12	
5D1	8300058	SFD 184	1N4148	
5D2	8300024	AA 119		
5D3 - 5D4	8300058	SFD 184	1N4148	
7D101/201	8300028	ZPD 9V1	BZX 79 9V1	
7D102/202	8300058	SFD 184	1N4148	
7D103/203	8300058	SFD 184	1N4148	
8D1	8310023	B80C3000/5000		
2IC1	8340033	TCA 420 A		
2IC4	8340032	MC 1310 PQ		
5IC1	8340031	TCA 440		

Colour of wires
Kabelfarben
Ledningsfarver

b	black	schwartz	sort
bl	blue	blau	blå
br	brown	braun	brun
gr	green	grün	grøn
grey	grey	grau	grå
or	orange	orange	orange
r	red	rot	rød
v	violet	violett	violet
wh	white	weiss	hvid
y	yellow	gelb	gul

3538280 Form. 7258

MALEBETINGELSER FOR DIAGRAM:

Alle DC spændinger er målt i forhold til stel med voltmeter (indre modstand 11 M Ohm).

DC spændinger *uden* parentes er målt med modtageren i stilling FM og antennesignal på 500 µV (1 mV EMK) med pilottone, volume på 0.

DC spændinger i AM delen *uden* parentes er målt med MW knappen aktiveret og signal på 1 V tilført kunstantenne (1 MHz).

DC spændinger *i* parentes er målt uden signal eller med muting aktiveret.

FM Signalniveauer er målt ved Δ f 40 kHz, f mod. 1 kHz og antennesignal på 500 µV, (1 mV EMK).

AM følsomheder er målt ved 30% modulation, f mod. 1 kHz og 5 W output, udgang belastet med 4 Ohm. Balance, bas, diskant på 0, volume på max.

LF følsomheder er målt ved 40 W output, Balance, bas, diskant på 0, volume på max. Udgang belastet med 4 Ohm, Input 1 kHz.

Mekaniske omskiftere er vist i neutral stilling.

CONDITIONS OF MEASUREMENT FOR DIAGRAM:

Alle DC Spannungen sind in Verhältnis zu Chassis mit Voltmeter (innerer Widerstand 11 M Ohm) gemessen.

DC Spannungen *ohne* Klammern sind mit dem Empfänger in Stellung FM und dem Antennensignal von 500 µV (1 mV EMK) mit Pilotton gemessen, Volume auf 0.

DC Spannungen im AM Teil *ohne* Klammern sind mit aktivisiertem MW Knopf und einem Signal von 1 V an die Kunstantenne zu geleitet gemessen.

DC Spannungen *in* Klammern sind ohne Signal oder mit aktivisiertem Stummabstimmung gemessen.

UKW Signalniveaus sind bei Δ f 40 kHz, f mod. 1 kHz und Antennensignal 500 µV gemessen. (1 mV FMK).

AM Empfindlichkeiten sind bei 30% Modulation, f mod. 1 kHz und 5 W Output gemessen. Ausgang mit 4 Ohm belastet. Balance, Tiefton, Diskant auf 0, Volume auf max.

NF Empfindlichkeiten sind an 40 W Ausgang gemessen. Balance, Tiefton, Diskant auf 0, Volume auf max. Ausgang mit 4 Ohm, Eingang 1 kHz belastet.

Mechanische Umschalter sind in neutraler Stellung gezeigt.

MESSBEDINGUNGEN FÜR SCHALTBILD:

All DC voltages are measured in proportion to chassis with voltmeter (inner resistance 11 M Ohm).

DC voltages *without* brackets are measured with the receiver in posion FM and an aerial signal of 500 µV (1 mV EMK) with pilot signal, volume on 0.

DC voltages in the AM section *without* brackets are measured with the MW button activated and a signal of 1 V, supplied to the dummy load.

DC voltages *with* brackets are measured without signal or with muting activated.

FM signal levels are measured at Δ f 40 kHz, f mod. 1 kHz and aerial signal 500 µV. (1 mV EMK).

AM sensitivities are measured at 30% modulation, f mod. 1 kHz and 5 W output, output loaded with 4 Ohm. Balance, bass, treble on 0, volume on max.

AF sensitivities are measured at 40 W output. Balance, bass, treble on 0, volume on max. Output loaded with 4 Ohm, input 1 kHz.

Mechanical switches are shown in neutral position.

TESTPUNKTER/TESTPOINTS/TESTPUNKTE

0TP1	Tuning voltage
0TP2	AGC voltage Aerial signal ⩽ 50 µV, AGC voltage 3,5 V Aerial signal 500 µV, AGC voltage 3 V Aerial signal ⩽ 50 mV, AGC voltage - 2 V
2TP4	Detector adjustment
2TP5	Detector adjustment
2TP6	IF adjustment
2TP7	Tuning indicator circuit Aerial signal ⩾ 5 µV, 2TP7 5,4 V Aerial signal ⩽ 5 µV, 2TP7 0 V
2TP9	Osc. adjustment (2C34) 3 V p.p. square-wave 10 kHz.
5TP5	Osc, 175 mV (f, aerial 1 MHz)
5TP6	Aerial signal 1 V, 5TP6 0,6 V DC. Aerial signal 0 V, 5TP6 0,06 V DC.
5TP7	Aerial signal 1 V, 5TP7 0,4 V DC. Aerial signal 0 V, 5TP7 0,03 V DC.
5TP8	Aerial 1V, 5TP8 0,4 V DC. Aerial signal 0 V, 5TP8 0,08 V DC.
5TP9	Aerial signal 1 V, 5TP9 0,57 V DC. Aerial signal 0 V, 5TP9 0,3 V DC.
7TP102	31,5 V
7TP202	31,5 V
7TP103	0 V ≙ 200 mV
7TP203	0 V ≙ 200 mV

FM SIGNALNIVEAUER/FM SIGNAL-LEVELS/UKW SIGNALNIVEAUS

2TP1	8 mV RF
2TP2	600 mV RF
2TP3	40 mV RF
2TP8	175 mV AF (AFC on). 30 mV 19 kHz level (pilot 9%)
2TP10	600 mV AF (AFC on)
2TP11	600 mV AF (AFC on)

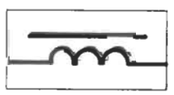
FØLSOMHEDER/SENSITIVITIES/EMPFINDLICHKEITEN

5TP1	15 µV
5TP2	75 µV
5TP3	20 mV
5TP4	20 mV
5TP101	2,4 mV
5TP201	2,4 mV
5TP102	175 mV
5TP202	175 mV
5TP103	175 mV
5TP203	175 mV
6TP101	170 mV
6TP201	170 mV
7TP101	160 mV
7TP201	160 mV
7TP103	12,7 V
7TP203	12,7 V

1 PC 8050063
Front end

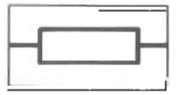
R1	5001050	47 Kohm 10% 1/8W
R2	5001062	330 Kohm 10% 1/2W
R3	5001062	330 Kohm 10% 1/2W
R4	5001013	100 ohm 10% 1/2W
R5	5001050	47 Kohm 10% 1/2W
R6	5001013	100 ohm 10% 1/2W
R7	5010141	27 Kohm 5% 1/8W
R8	5010041	5,6 Kohm 5% 1/8W
R9	5010076	3,3 Kohm 5% 1/8W
R10	5010411	47 ohm 5% 1/8W
R11	5010067	560 ohm 5% 1/8W
R12	5001038	4,7 Kohm 10% 1/2W
R13	5001013	100 ohm 10% 1/2W
R14	5001040	6.8 Kohm 10% 1/2W

C1	4010008	1 nF -20+50% 400V
C2	4330001	1 - 9 pF Cer
C3	4010008	1 nF -20+50% 400V
C4	4330001	1 9 pF Cer
C5	4010008	1 nF -20+50% 400V
C6	4010008	1 nF -20+50% 400V
C7	4010008	1 nF -20+50% 400V
C8	4010008	1 nF -20+50% 400V
C9	4003012	3,3 pF 0,25 pF 400V
C10	4330001	1 - 9 pF Cer
C11	4010008	1 nF -20+50% 400V
C12	4200107	10 uF 10V
C13	4001011	8,2 pF 0,5 pF 400
C14	4003130	47 pF 2% 63V
C15	4010008	1 nF -20+50% 400V
C16	4003059	22 pF 5% 250V
C17	4130081	10 nF 20% 250V
C18	4101007	220 pF 5% 63V
C19	4330001	1 - 9 pF Cer
C20	4000089	8,2 pF 0,5 pF 250V
C21	4101031	270 pF 5% 63V
C22	4010008	1 nF -20+50% 400V
C23	4010018	1 nF 250V
C24	4010018	1 nF 250V
C25	4000089	8,2 pF 0,5 pF 250V
C26	4010018	1 nF 250V

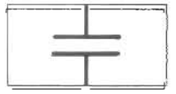


L1	8020120	
L2	8020121	
L3	8020122	
L4	6830052	3,8 uH 5%
L5	6830052	3,8 uH 5%
L6	6710001	
L7	8020124	10,7 MHz
L8	8020137	10,7 MHz
L9	8020188	Osc.
L10	6830052	3,8 uH 5%
	6702004	Ferricore r
	6702001	Ferricore wh
	6479001	Glasshushing

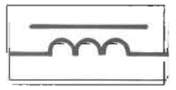
2 PC 8002129
IF Section and decoder



R1	5010065	100 ohm 5% 1/8W
R2	5010046	12 Kohm 5% 1/8W
R3	5010044	330 ohm 5% 1/8W
R4	5010044	330 ohm 5% 1/8W
R5	5010048	4,7 Kohm 5% 1/8W
R6	5010044	330 ohm 5% 1/8W
R8	5001065	470 Kohm 10% 1/2W
R9	5000044	22 Kohm 10% 1/2W
R10	5010070	390 ohm 5% 1/8W
R11	5370058	5 Kohm 20% LIN
R12	5010069	3,9 Kohm 5% 1/8W
R13	5010247	1,5 Kohm 5% 1/8W
R14	5010144	680 ohm 5% 1/8W
R15	5010064	2,2 Kohm 5% 1/8W
R16	5010639	27 Kohm 2% 1/8W
R17	5010639	27 Kohm 2% 1/8W
R18	5010040	1 Kohm 5% 1/8W
R19	5010135	18 Kohm 5% 1/8W
R20	5010070	390 ohm 5% 1/8W
R21	5010135	18 Kohm 5% 1/8W
R22	5010040	1 Kohm 5% 1/8W
R23	5010639	27 Kohm 2% 1/8W
R24	5010639	27 Kohm 2% 1/8W
R25	5010639	27 Kohm 2% 1/8W
R26	5010639	27 Kohm 2% 1/8W
R27	5010058	470 ohm 5% 1/8W
R28	5370128	100 Kohm 20% LIN
R29	5001051	56 Kohm 10% 1/2W
R30	5001051	56 Kohm 10% 1/2W
R31	5370059	250 ohm 20% LIN
R32	5010056	82 ohm 5% 1/8W
R33	5010056	82 ohm 5% 1/8W
R34	5001034	2,2 Kohm 10% 1/8W
R35	5010595	12 ohm 5% 1/8W
R36	5010066	1,8 Kohm 5% 1/8W
R37	5011013	100 ohm 5% 1/4W
R38	5010041	5,6 Kohm 5% 1/8W
R39	5001038	4,7 Kohm 10% 1/2W
R40	5370058	5 Kohm 20% LIN
R41	5000044	22 Kohm 10% 1/2W
R42	5002014	120 ohm 10% 1W
R43	5010064	2,2 Kohm 5% 1/8W
R44	5010064	2,2 Kohm 5% 1/8W
R45	5010045	4,7 Kohm 5% 1/8W
R46	5020034	18,7 Kohm 1%
R47	5010040	1 Kohm 5% 1/8W
R48	5010041	5,6 Kohm 5% 1/8W
R49	5010041	5,6 Kohm 5% 1/8W
R50	5010117	330 Kohm 5% 1/8W
R51	5010298	2,7 Kohm 5% 1/8W
R52	5010061	56 Kohm 5% 1/8W
R53	5010044	330 ohm 5% 1/8W
R54	5370058	5 Kohm 20% LIN
R55	5010117	330 Kohm 5% 1/8W
R56	5010298	2,7 Kohm 5% 1/8W
R57	5010064	2,2 Kohm 5% 1/8W
R58	5010061	56 Kohm 5% 1/8W
R59	5010044	330 ohm 5% 1/8
R60	5010046	12 Kohm 5% 1/8W
R61	5010046	12 Kohm 5% 1/8W
R63	5370050	1 Kohm 20% LIN
R64	5010048	4,7 Kohm 5% 1/8W
R65	5011033	1,8 Kohm 5% 1/4W



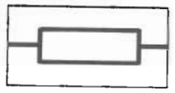
C1	4010041	10 nF -20+100% 40V
C2	4010041	10 nF -20+100% 40V
C3	4010041	10 nF -20+100% 40V
C4	4010027	1 nF 10% 100V
C5	4010041	10 nF -20+100% 40V
C6	4010060	22 nF -20+100% 40V
C7	4010041	10 nF -20+100% 40V
C8	4010060	22 nF -20+100% 40V
C9	4010041	10 nF -20+100% 40V
C10	4003125	33 pF 2% 63V
C11	4010021	220 pF 10% 100V
C12	4100045	560 pF 5% 63V
C13	4003125	33 pF 2% 63V
C14	4100045	560 pF 5% 63V
C15	4201057	1 uF 35V
C16	4201058	0,47 uF 35V
C17	4201058	0,47 uF 35V
C18	4200101	10 uF 16V
C19	4200101	10 uF 16V
C20	4200169	0,1 uF 35V
C21	4200101	10 uF 16V
C22	4201069	2,2 uF 35V
C23	4010041	10 nF -20+100% 40V
C24	4200275	470 uF 40V
C25	4136103	0,1 uF 35V
C26	4136103	0,1 uF 35V
C29	4010066	22 nF -20+100% 40V
C30	4003130	47 pF 2% 63V
C31	4201069	2,2 uF 35V
C32	4130087	47 nF 10% 250V
C33	4010031	680 pF 10% 100V
C34	4340003	60 pF foil
C35	4100044	440 pF 1% 63V
C36	4201058	0,47 uF 35V
C37	4136086	0,22 uF 10% 250V
C38	4136114	0,47 uF 10% 100V
C39	4100026	10 nF 5% 63V
C40	4100026	10 nF 5% 63V
C41	4201069	2,2 uF 35V
C42	4201069	2,2 uF 35V
C43	4201057	1 uF 35V
C44	4201057	1 uF 35V
C45	4100033	3,3 nF 5% 63V
C46	4100029	2,2 nF 5% 63V
C47	4100029	2,2 nF 5% 63V
C48	4100033	3,3 nF 5% 63V
C49	4100029	2,2 nF 5% 63V
C50	4100029	2,2 nF 5% 63V
C51	4010066	22 nF -20+100% 40V
C52	4010066	22 nF -20+100% 40V
C53	4010041	10 nF -20+100% 40V



L1	8020065	136 uH
L2	8020260	FM det.
L3	8022035	114 kHz
L4	8022035	114 kHz
L5	8022035	114 kHz

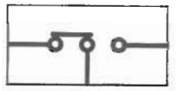
BP1	8030001	10,7 MHz Cer.
BP2	8030001	10,7 MHz Cer.
BP3	8030001	10,7 MHz Cer.

3 PC 8002130
Pre - set tuning



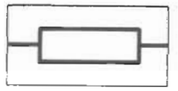
R1	5300085	100 Kohm
R2	5300085	100 Kohm
R3	5300085	100 Kohm
R4	5300085	100 Kohm
R5	5300085	100 Kohm
R6	5370178	10 Kohm 20% LIN

C1	4201057	1 uF 35V
C2	4201057	1 uF 35V
C3	4201057	1 uF 35V
C4	4201057	1 uF 35V
C5	4201057	1 uF 35V



7400102	Switch AFC	
7400102	Switch Muting	

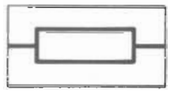
4 PC 8002131
Indicator circuit



R1	5001009	56 ohm 10% 1/2W
R2	5001006	33 ohm 10% 1/2W
R3	5001026	680 ohm 10% 1/2W
R4	5100184	56 ohm 5% 2

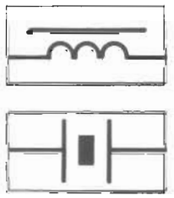
IL1	8230040	12 V 30 mA
IL2	8230040	12 V 30 mA
IL3	8230040	12 V 30 mA
IL4	8230040	12 V 30 mA

5 PC 8002127
AM IF - section and pre-amplifier



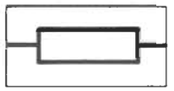
R1	5010079	22 Kohm 5% 1/8W
R2	5010040	1 Kohm 5% 1/8W
R3	5001041	8,2 Kohm 10% 1/2W
R4	5001013	100 ohm 10% 1/2W
R5	5001049	39 Kohm 10% 1/2W
R6	5001043	12 Kohm 10% 1/2W
R7	5001055	100 Kohm 10% 1/2W
R8	5001058	180 Kohm 10% 1/2W
R9	5010075	33 Kohm 5% 1/8W
R10	5010075	33 Kohm 5% 1/8W
R11	5001038	4,7 Kohm 10% 1/2W
R12	5010072	180 Kohm 5% 1/8W
R13	5370074	10 Kohm 20% LIN
R14	5010040	1 Kohm 5% 1/8W
R15	5001015	120 ohm 10% 1/2W
R16	5010506	10 ohm 5% 1/8W
R17	5001019	220 ohm 10% 1/2W
R18	5002017	220 ohm 10% 1W
R19	5010052	6,8 Kohm 5% 1/8W
R20	5010079	22 Kohm 5% 1/8W
R21	5010045	47 Kohm 5% 1/8W
R22	5010040	1 Kohm 5% 1/8W
R23	5001029	1 Kohm 10% 1/2W
R24	5001039	5,6 Kohm 10% 1/2W
R25	5010065	100 ohm 5% 1/8W
R101	5010146	220 Kohm 5% 1/8W
R102	5010061	56 Kohm 5% 1/8W
R103	5011062	270 Kohm 5% 1/4W
R104	5010058	470 ohm 5% 1/8W
R105	5010141	27 Kohm 5% 1/8W
R106	5011067	680 Kohm 5% 1/4W
R107	5010066	1,8 Kohm 5% 1/8W
R108	5010041	5,6 Kohm 5% 1/8W
R109	5010058	470 ohm 5% 1/8W
R110	5010048	4,7 Kohm 5% 1/8W
R111	5011072	1,8 Mohm 10% 1/4W
R112	5011083	10 Mohm 10% 1/4W
R113	5010079	22 Kohm 5% 1/8W
R114	5010111	100 Kohm 5% 1/8W
R115	5010048	4,7 Kohm 5% 1/8W
R116	5010111	100Kohm 5% 1/8W
R117	5010048	4,7 Kohm 5% 1/8W
R118	5011072	1.8 Mohm 10% 1/4W
R119	5011083	10 Mohm 10% 1/4W
R120	5010079	22 Kohm 5% 1/8W
R121	5010048	4,7 Kohm 5% 1/8W
R122	5010111	100Kohm 5% 1/8W
R123	5010120	220 Kohm 5% 1/8W
R124	5010079	22 Kohm 5% 1/8W
R125	5010141	27 Kohm 5% 1/8W
R126	5010141	27 Kohm 5% 1/8W
R127	5010120	220 Kohm 5% 1/8W
R128	5010079	22 Kohm 5% 1/8W
R129	5010120	220 Kohm 5% 1/8W
R130	5010117	330 Kohm 5% 1/8W
R201	5010146	220 Kohm 5% 1/8W
R202	5010061	56 Kohm 5% 1/8W
R203	5011062	270 Kohm 5% 1/4W
R204	5010058	470 ohm 5% 1/8W
R205	5010141	27 Kohm 5% 1/8W
R206	5011067	680 Kohm 5% 1/4W
R207	5010066	1,8 Kohm 5% 1/8W
R208	5010041	5,6 Kohm 5% 1/8W
R209	5010058	470 ohm 5% 1/8W
R210	5010048	4,7 Kohm 5% 1/8W
R211	5011072	1,8 Mohm 10% 1/4W
R212	5011083	10 Mohm 10% 1/4W
R213	5010079	22 Kohm 5% 1/8W
R214	5010111	100 Kohm 5% 1/8W
R215	5010048	4,7 Kohm 5% 1/8W
R216	5010111	100 Kohm 5% 1/8W
R217	5010048	4.7 Kohm 5% 1/8W
R218	5011072	1,8 Mohm 10% 1/4W
R219	5011083	10 Mohm 10% 1/4w
R220	5010079	22 Kohm 5% 1/8W
R221	5010048	4,7 Kohm 5% 1/8W
R222	5010111	100 Kohm 5% 1/8W
R223	5010120	220 Kohm 5% 1/8W
R224	5010079	22 Kohm 5% 1/8W
R225	5010141	27 Kohm 5% 1/8W
R226	5010141	27 Kohm 5% 1/8W
R227	5010120	220 Kohm 5% 1/8W
R228	5010079	22 Kohm 5% 1/8W
R229	5010120	220 Kohm 5% 1/8W
R230	5010117	330 Kohm 5% 1/8W

C1	4000016	10 pF 2% 63V
C2	4340003	60 pF foil
C3	4010063	4,7 nF 10% 63V
C4	4340002	20 pF foil
C5	4130103	0,1 µF 20% 250V
C6	4340002	20 pF foil
C7	4161018	470 pF 5% 63V
C8	4101034	150 pF 2,5% 63V
C9	4340003	60 pF foil
C10	4000026	22 pF 2% 63V
C11	4130103	0,1 µF 20% 250V
C12	4101026	4,7 nF 5% 63V
C13	4010060	22 nF -20+100% 40V
C14	4101006	180 pF 5% 63V
C15	4200171	100 µF 3V
C16	4011025	3,3 nF 10% 100V
C17	4102111	1,5 nF 5% 160V
C18	4101004	680 pF 5% 63V
C19	4101004	680 pF 5% 63V
C20	4000029	220 pF 5% 63V
C21	4010060	22 nF -20+100% 40V
C22	4130103	0,1 µF 20% 250V
C23	4130103	0,1 µF 20% 250V
C24	4130103	0,1 µF 20% 250V
C25	4200108	4,7 µF 25V
C26	4100002	1,6 µF 5% 25V
C27	4011025	3,3 nF 10% 100V
C28	4130103	0,1 µF 20% 250V
C29	4011025	3,3 nF 10% 250V
C30	4000071	270 pF 5% 63V
C31	4201058	0,47 µF 35V
C33	4201066	100 uF 40V
C34	4200185	220 uF 25V
C35	4201069	2,2 µF 35V
C36	4200098	100 uF 40V
C101	4200108	4,7 µF 25V
C102	4010037	390 pF 100V
C103	4011025	3,3 nF 10% 100V
C104	4130109	10 nF 10% 250V
C105	4003128	100 pF 5% 100V
C106	4201057	1 uF 35V
C107	4201018	470 pF 5% 63V
C108	4101018	470 pF 5% 63V
C109	4201057	1 uF 35V
C110	4201057	1 uF 35V
C111	4101018	470 pF 5% 63V
C112	4201057	1 uF 35V
C113	4201058	0,47 uF 35V
C201	4200168	4,7 uF 25V
C202	4010037	390 pF 10% 100V
C203	4011025	3,3 nF 10% 100V
C204	4130109	10 nF 10% 250V
C205	4003128	100 pF 5% 63V
C206	4201057	1 uF 35V
C207	4201057	1 uF 35V
C208	4101018	470 pF 5% 63V
C209	4201057	1 uF 35V
C210	4201057	1 uF 35V
C211	4101018	470 pF 5% 63V
C212	4201057	1 uF 35V
C215	4201058	0,47 uF 35V



L1	8020219	LW RF
L2	8020106	MW RF
L3	8020261	LW Osc.
L4	8020262	MW Osc.
L5	8020222	468 kHz filter
L6	8020114	468 kHz filter
L7	8020263	468 kHz IF
L8	8020224	468 kHz IF
L9	8020264	468 kHz IF
L10	8020265	AM Det.
X1	8030006	468 kHz Cer. res.
X2	8030006	468 kHz Cer. res.

6 PC 8002126
Tone amplifier



R101	5010043	1 Kohm 5% 1/8W	R201	5010043	1 Kohm 5% 1/8W
R102	5010072	180 Kohm 5% 1/8W	R202	5010072	180 Kohm 5% 1/8W
R103	5010077	470 Kohm 5% 1/8W	R203	5010077	470 Kohm 5% 1/8W
R104	5010048	4,7 Kohm 5% 1/8W	R204	5010048	4,7 Kohm 5% 1/8W
R105	5010144	680 ohm 5% 1/8W	R205	5010144	680 ohm 5% 1/8W
R106	5010076	3,3 Kohm 5% 1/8W	R206	5010076	3,3 Kohm 5% 1/8W
R107	5310057	2 x 22 Kohm TREBLE	R207	5310057	2 x 22 Kohm TREBLE
R108	5010076	3,3 Kohm 5% 1/8W	R208	5010076	3,3 Kohm 5% 1/8W
R109	5310058	2 x 47 Kohm BASS	R209	5310058	2 x 47 Kohm BASS
R110	5010144	680 ohm 5% 1/8W	R210	5010144	680 ohm 5% 1/8W
R111	5010076	3,3 Kohm 5% 1/8W	R211	5010076	3,3 Kohm 5% 1/8W
R112	5010043	1 Kohm 5% 1/8W	R212	5010043	1 Kohm 5% 1/8W
R113	5010048	4,7 Kohm 5% 1/8W	R213	5010048	4,7 Kohm 5% 1/8W
R114	5010079	22 Kohm 5% 1/8W	R214	5010079	22 Kohm 5% 1/8W
R115	5010047	120 Kohm 5% 1/8W	R215	5010047	120 Kohm 5% 1/8W
R116	5010079	22 Kohm 5% 1/8W	R216	5010079	22 Kohm 5% 1/8W
R117	5010154	8,2 Kohm 5% 1/8W	R217	5010154	8,2 Kohm 5% 1/8W
R118	5010092	220 ohm 5% 1/8W	R218	5010092	220 ohm 5% 1/8W
R119	5310055	2 x 22 Kohm VOLUME	R219	5310055	2 x 22 Kohm VOLUME
R120	5310056	2 x 22 Kohm BALANCE	R220	5310056	2 x 22 Kohm BALANCE

C101	4201057	1 uF 35V	C201	4201057	1 uF 35V
C102	4010027	1 nF 10% 100V	C202	4010027	1 nF 10% 100V
C103	4201069	2,2 uF 35V	C203	4201069	2,2 uF 35V
C104	4130097	15 nF 10% 250V	C204	4130097	15 nF 10% 250V
C105	4010027	1 nF 10% 100V	C205	4010027	1 nF 10% 100V
C106	4130107	0,1 uF 10% 250V	C206	4130107	0,1 uF 10% 250V
C107	4010027	1 nF 10% 100V	C207	4010027	1 nF 10% 100V
C108	4130107	0,1 uF 10% 250V	C208	4130107	0,1 uF 10% 250V
C109	4130097	15 nF 10% 250V	C209	4130097	15 nF 10% 250V
C110	4200107	10 uF 10V	C210	4200107	10 uF 10V
C111	4010027	1 nF 10% 100V	C211	4010027	1 nF 10% 100V
C112	4200107	10 uF 10V	C212	4200107	10 uF 10V
C113	4201069	2,2 uF 35V	C213	4201069	2,2 uF 35V
C114	4010061	2,2 nF 10% 63V	C214	4010061	2,2 nF 10% 63V
C115	4201069	2,2 uF 35V	C215	4201069	2,2 uF 35V

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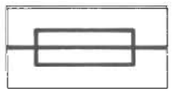
Output amplifier

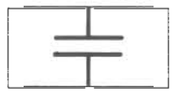
R1	5002014	120 ohm 10% 1W	R201	5010040	1 Kohm 5% 1/8W
R101	5010040	1 Kohm 5% 1/8W	R202	5010045	47 Kohm 5% 1/8W
R102	5010045	47 Kohm 5% 1/8W	R203	5010247	1,5 Kohm 5% 1/8W
R103	5010247	1,5 Kohm 5% 1/8W	R204	5010059	10 Kohm 5% 1/8W
R104	5010059	10 Kohm 5% 1/8W	R205	5010067	560 ohm 5% 1/8W
R105	5010067	560 ohm 5% 1/8W	R206	5010041	5,6 Kohm 5% 1/8W
R106	5010041	5,6 Kohm 5% 1/8W	R207	5010045	47 Kohm 5% 1/8W
R107	5010045	47 Kohm 5% 1/8W	R208	5010059	10 Kohm 5% 1/8W
R108	5010059	10 Kohm 5% 1/8W	R209	5001004	22 ohm 10% 1/2W
R109	5001004	22 ohm 10% 1/1W	R210	5020040	10 ohm 10% 0,7W
R110	5020040	10 ohm 10% 0,7W	R211	5001041	8,2 Kohm 10% 1/2W
R111	5001041	8,2 Kohm 10% 1/2W	R212	5001041	8,2 Kohm 10% 1/2W
R112	5001041	8,2 Kohm 10% 1/2W	R213	5010144	680 ohm 5% 1/8W
R113	5010144	680 ohm 5% 1/8W	R214	5010000	270 ohm 5% 1/2W
R114	5010000	270 ohm 5% 1/2W	R215	5010000	270 ohm 5% 1/2W
R115	5010000	270 ohm 5% 1/2W	R216	5010128	120 ohm 5% 1/2W
R116	5010128	120 ohm 5% 1/2W	R217	5370174	250 ohm 20% LIN
R117	5370174	250 ohm 20% LIN	R218	5010044	330 ohm 5% 1/2W
R118	5010044	330 ohm 5% 1/2W	R219	5100166	0,39 ohm 10% 2W
R119	5100166	0,39 ohm 10% 2W	R220	5100166	0,39 ohm 10% 2W
R120	5100166	0,39 ohm 10% 2W			

C1	4201060	100 µF 40V	C109	4130103	0,1 µF 20% 250V
C37	4200306	5000 µF 35V	C201	4201058	0,47 µF 35V
C38	4200306	5000 µF 35V	C202	4010027	1 nF 10% 100V
C101	4201058	0,47 µF 35V	C203	4200218	22 uF 6V
C102	4010027	1 nF 10% 100V	C204	4000019	68 pF 5% 63V
C103	4200218	22 uF 6V	C205	4130103	0,1 µF 20% 250V
C104	4000019	68 pF 5% 63V	C206	4130079	22 nF 20% 250V
C105	4130103	0,1 µF 20% 250V	C207	4130079	22 nF 20% 250V
C106	4130079	22 nF 20% 250V	C208	4130103	0,1 µF 20% 250V
C107	4130079	22 nF 20% 250V	C209	4130103	0,1 uF 20% 250V
C108	4130103	0,1 uF 20% 250V			



F101	6600022	1,6 AT	F202	6600022	1,6 AT
F102	6600022	1,6 AT		7500002	Holder for fuses
F201	6600022	1,6 AT			

8 PC 8002133
Power supply



C1	4130029	0,47 µF 10% 250V	
C2	4130029	0,47 µF 10% 250V	

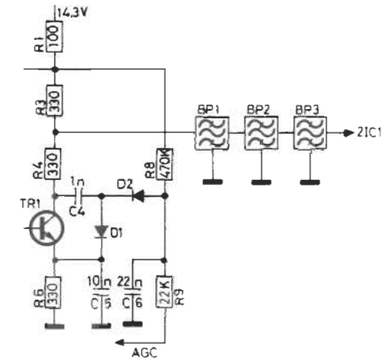
FUNCTIONAL DESCRIPTION,

FM TUNER

The tuner has 75-Ohm and 300-Ohm aerial inputs. The input stage comprises two field-effect transistors in a cascode circuit. The mixer and oscillator functions are separate, and tuning is done with capacitance diodes.

FM IF

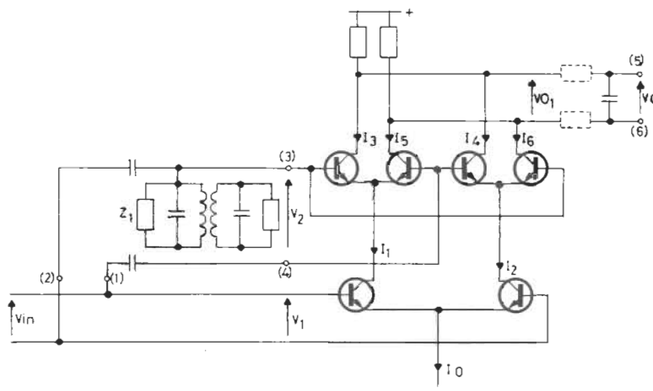
The tuner output signal is fed to 2TR1 for amplification.
From there, it passes through three ceramic filters 2BP1, 2 and 3, each of which introduces approx. 6 dB attenuation, and from there to pin 15 of 2IC1.



Part of the signal at the collector of 2TR1 is rectified by 2D1 and 2. The rectified voltage is employed as AGC bias for the tuner and is applied to the gate of 1TR1.

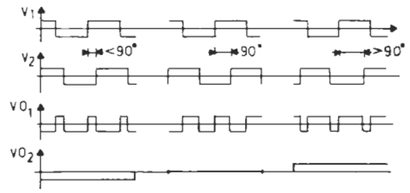
2IC1

The IF amplifier/limiter and detector are an IC circuit, TCA 420A.
The IC provides typically 65 dB of gain, and the detector is a quadature detector. The advantage of this type of detector is very low harmonic distortion.
The basic circuit of the quadrature detector is shown in the sketch below.



The quadrature detector in the TCA 420A is composed of a phase detector and a phase shift network. The mode of operation of the phase detector will appear from the chart.

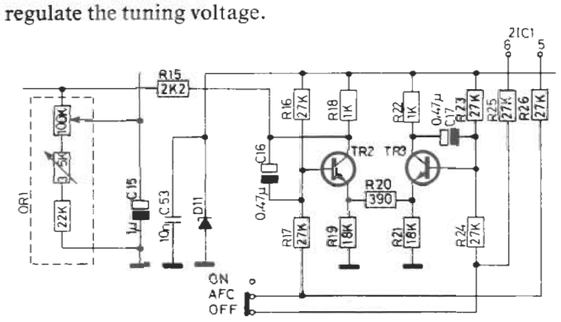
V_1	V_2	I_1	I_3	I_5	I_2	I_4	I_6	VO_1
-	-	0	0	0	I_0	I_0	0	-
-	•	0	0	0	I_0	0	I_0	•
•	-	I_0	0	I_0	0	0	0	•
•	•	I_0	I_0	0	0	0	0	-



From this it will be seen that the output voltage, V_{01}, is positive when the two input voltages V_1 and V_2 have opposite polarity, and negative when the input voltages have identical polarity.
The IF signal is fed to the V_{in} terminals.
The phase shift network Z_1 shifts the phase between the two input voltages, V_1 and V_2, as a function of the frequency applied.
From the time diagrams it will be seen that the DC value of the output voltage (V_{02}) is zero when the phase shift is 90°; negative when the phase shift is $< 90°$ and positive when the phase shift is $> 90°$.
If V_{in} is a frequency-modulated signal, the phase between V_1 and V_2 will be shifted "in step" with the modulation, and the output voltage V_{02} will be proportionale thereto and is consequently the demodulated signal.
The demodulated signal is taken off at pins 5 and 6 of 2IC1 for AFC and balance light. The signal from pin 6 is fed to the stereo decoder.

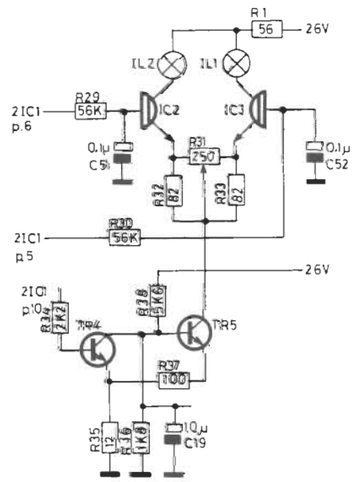
TUNING AND AFC

The signals from pins 5 and 6 are fed to the AFC circuit which consists of a differential amplifier, 2TR2 and 3.
The differential amplifier ensures that only differential signals from pins 5 and 6 will affect the tuning.
This arrangement prevents supply voltage variations from affecting the tuning.
Tuning voltage is taken off from the collector of 2TR2.
It is this voltage which is used as AFC voltage seeing that an error voltage from the detector will cause a voltage change at the collector of 2TR2 and thereby regulate the tuning voltage.



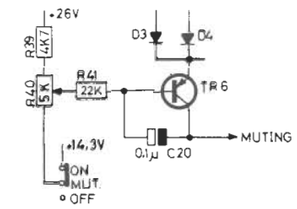
INDICATOR BALANCE

The signals from pins 5 and 6 are also used for indicator balance. They are applied to the bases of 2IC2 and 3.
When the receiver is tuned correctly to a station, the lamps in the collector circuits of 2IC2 and 3 will show equal brilliance. However, 2IC2 and 3 can draw current only if 2TR5 is conductive. Pin 10 of 2IC1 will carry a 10W level when an IF signal is present. This level will cut off 2TR4, and 2TR5 will consequently draw current.
The voltage change at the collector of 2TR4 is also fed to the stereo decoder, cancelling the stereo decoder cut-off in the presence of an IF signal.



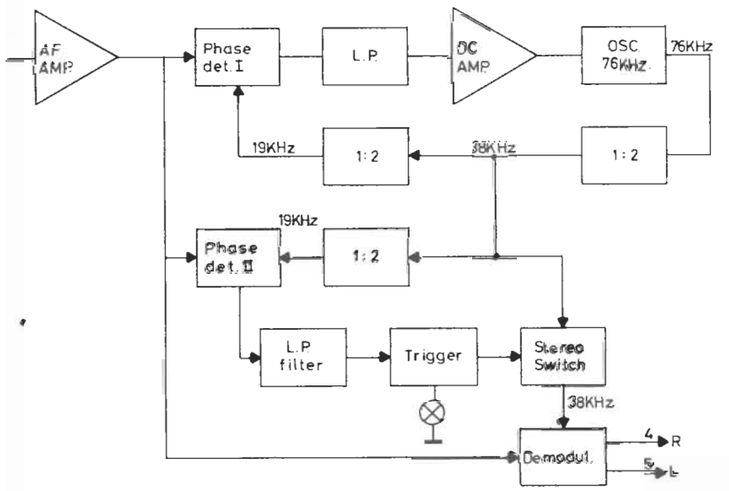
MUTING ON FM

For tuning across the FM dial, the muting feature may be cut in by operating the MUTING switch, thereby silencing the receiver between stations.
The collectors of 2IC2 and 3 connect through 2D3 and 4 to the emitter of 2TR6. In case no current flows through one or both transistors (detuning or off-station), 2TR6 will be conductive, and a positive voltage will be applied to the muting circuit 5TR106 and 206, which shorts the signal to chassis potential.
2C20 prevents deep strong bass frequencies from causing periodic muting.



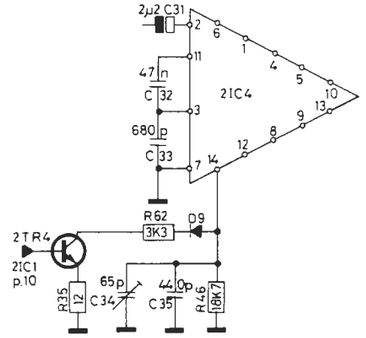
STEREO DECODER

The AF signal is fed to pin 2 of the stereo decoder 2IC4.



The block diagram shows 2IC4. As will be seen, the IC contains an oscillator operating at 76 kHz. The internal oscillator is phaselocked by the 19 kHz content of the MPX signal. This principle provides a high order of longterm stability.
The MPX signal from the detector is fed to the amplifier, whose output is fed to the demodulator and the phase detectors.
The phase detectors compare the 19 kHz signal from the internal oscillator with the 19 kHz content of the MPX signal. Correction voltage from phase detector I (depending on the phase relations between external and internal 19 kHz) is fed via a lowpass filter and a DC amplifier to a DC-controlled 76 kHz oscillator. This oscillator is adjustable from outside with trimmer capacitor 2C34.
To turn on the stereo indicator and activate the stereo switch, both 19 kHz from the MPX signal and 19 kHz from the internal oscillator must be present. If this condition is met, a trigger circuit is activated from phase detector II to turn on the lamp and feed 38 kHz via the stereo switch to the demodulator. The stereo signal can now be taken off at pins 4 and 5.

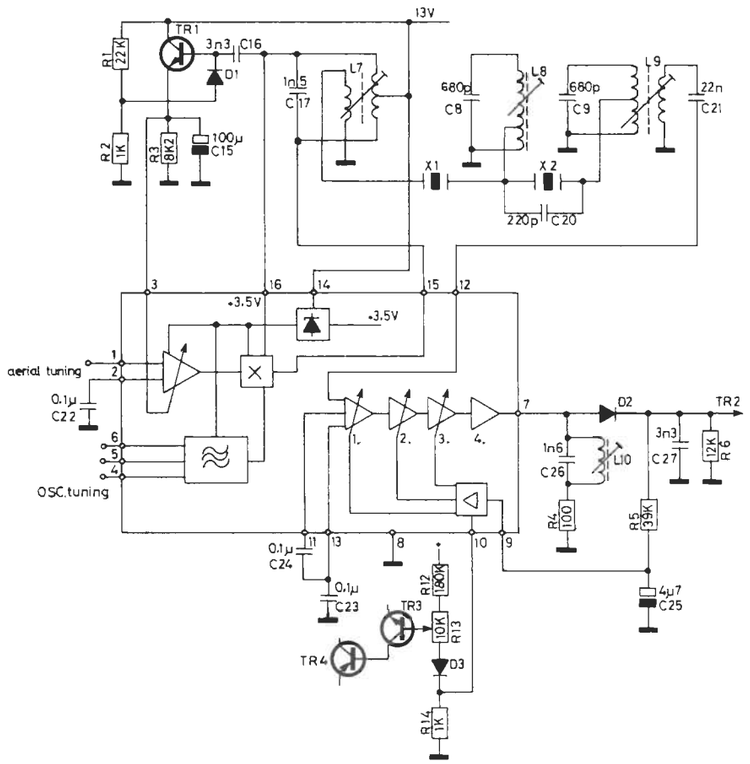
If the IF signal is too weak, pin 14 will be pulled towards chassis potential through 2D9 and 2TR4, and the internal oscillator will stop. The IC circuit will now operate only as an amplifier, and the signal output will be mono.



From pins 4 and 5, the signal is fed to 2TR10 and 2TR11 where separation between right and left channels can be adjusted with 2R54. The AF signals moreover pass through two 19/38 kHz filters before being fed to the push-button switch.

AM

The AM section is based on 5IC1. This IC contains an AGC-controlled RF stage, oscillator, mixer, and an AGC-controlled IF amplifier.



The signal picked up by the aerial is fed to pins 1 and 2. The oscillator tank circuit is connected to pins 4, 5 and 6. After mixing, a symmetrical IF signal is taken off at pins 15 and 16. Part of this signal provides, via 5TR1, RF AGC for the signal frequency circuit through pin 3. After IF tuning, effected both by ceramic filters and by LC circuits, the IF signal is fed to pin 12 for amplification, whereupon it is taken off at pin 7. From there, the signal passes to the AM detector whereupon it is routed through an emitter follower, 5TR2, before being fed to the pushbutton switch. Part of the DC output of the detectors is taken off, the AF component being filtered off by 5R5 and 5C25; and the resulting voltage is fed to pin 9 as IF AGC bias.

Pin 10 carries a voltage which varies in step with RF signal strength. This voltage is employed, via 5TR3 and 4, for tuning indication.
The AM section receives supply voltage only with the LW or MW button operated.

PHONO

The phono input is a lowimpedance input, using an RIAA compensated preamplifier consisting of three transistors 5TR101, 102 and 103 for the left channel and 5TR201, 202 and 203 for the right channel.

TAPE

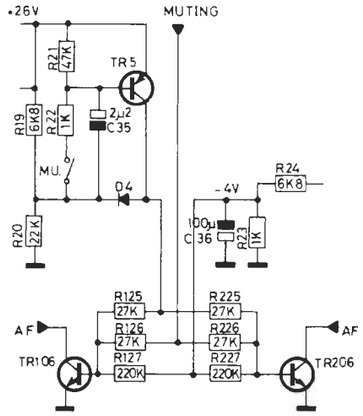
There is provision for connection of two tape recorders.
Both tape inputs are highimpedance ones, and recording and playback on both TAPE I and TAPE II are possible.
TAPE I has a monitoring function, and recording from TAPE I to TAPE II can be performed.

TONE AMPLIFIER

From FM, PHONO, or TAPE, the AF signal passes to the tone amplifier, which consists of two transistors, 6TR101 and 102 in the left channel, and 6TR201 and 202 in the right channel. The amplifier contains bass and treble regulation, loudness switch, and volume and balance controls.

MUTING

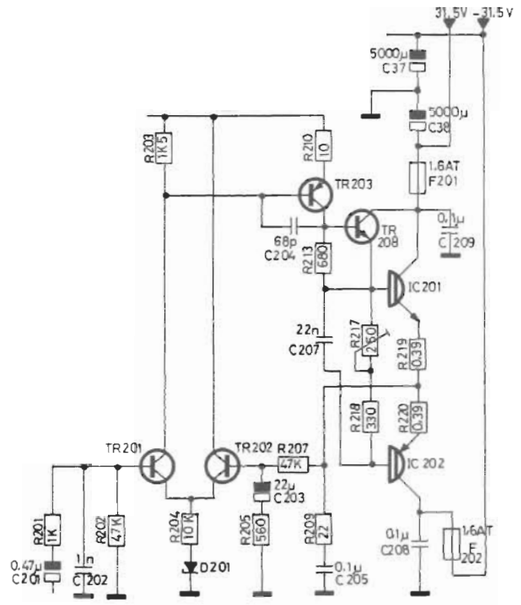
The muting circuit is composed of 5TR106, 206 and 5TR5.



Through 5TR5, positive voltage is applied to the base of 5TR106 and 206 each time one of the program selector buttons (MU) is operated. After the button has been released, the muting transistor 5TR5 will remain conductive for some time due to charging of 5C35 through the transistor's diode junction and through 5R21.
Activation of the muting circuit will cause 5TR106 and 206 to short the AF signals to chassis potential, but otherwise the transistors will be prevented from conducting, by a negative bias of -4V from voltage divider 5R24/23.

AF OUTPUT

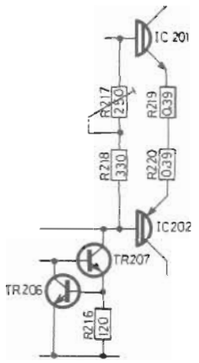
The output amplifier has high gain and heavy inverse feedback, resulting in very low distortion and low output impedance. Supply voltage for the output amplifier is obtained directly from the rectifier, decoupled by 7C37 and 38. Both plus and minus voltages are employed (split supply).



The signal is fed to the base of 7TR201 (right channel), which is one half of a differential circuit with 7TR202.
The AF signal is heavily amplified by 7TR201 and 203 whereupon it is passed to the output transistors, which operate in a Darlington circuit, via emitter follower 7TR208. From the output, part of the signal is taken off and fed through 7R207 to the base of 7TR202 as inverse feedback.

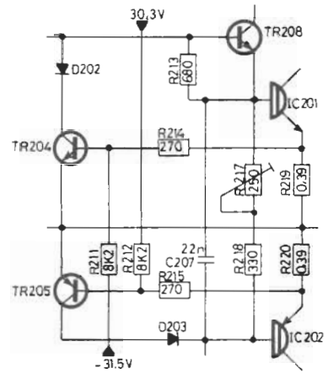
Reasonably constant no-signal current in output transistors 7IC202 and 202 is ensured by a constant-current generator 7IC206, 207 and 216. No-signal current is adjusted with 7R217.

The no-signal current is made independent of output transistor temperature by placing 7TR206 as a sensor transistor on the same heat sink with the output transistors. A temperature increase will make the nosignal current attempt to increase, but at the same time the voltage across 7R216 (base/emitter junction of 7TR206) and hence across 7R217 will drop, thus causing the no-signal current to return to its original value.



OUTPUT PROTECTION

The output is protected against overloading or short-circuits by 7TR204 and 205, which "feel" the voltage drop across the emitter resistors of the output transistors. Excessive output-circuit current will cause 7TR204 and 205 to start drawing current, there by reducing the bias to the output transistors. as a result of which the current will drop.
In order to protect the speakers against DC voltage in case of a defective output circuit, two 1.6 A slow-blow fuses are provided in either channel. In order to be capable of standing the current that will flow before the fuse blows, the speakers must have a minimum rating of 40W r.m.s.



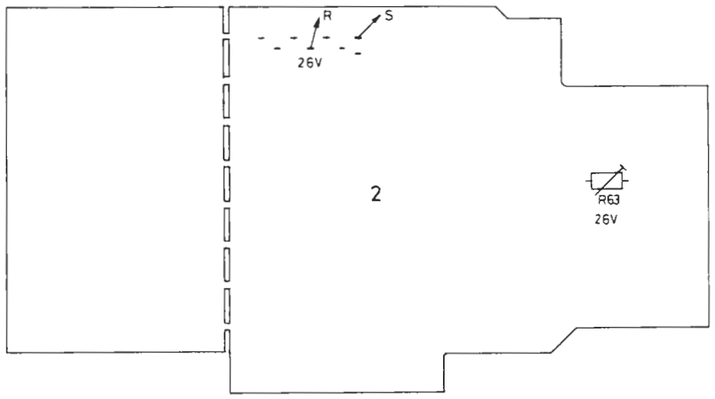
POWER SUPPLY

The stabilised power supply consist of 2TR8 and 9 and delivers 26V for use in the preamplifiers, tone amplifiers, and the AFC and indicator circuit. From the 36V supply, additional stabilisation is performed with 2TR7. The resulting voltage, 14.3V, is used in the tuner, FM-IF Section, decoder, and AM section.

ADJUSTMENTS

POWER SUPPLY

Set receiver to FM. With potentiometer 2R63 adjust for 26V.

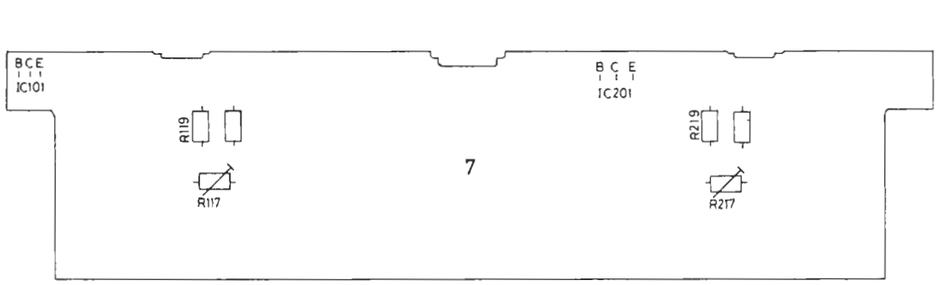


NO-SIGNAL-CURRENT

Adjust no-signal current with receiver cold and volume control turned down.

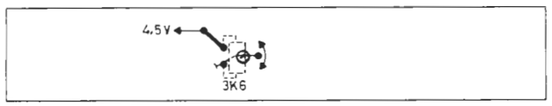
SPEAKERS MUST NOT BE CONNECTED

With 7R117 (7R217) adjust for 25 mA collector current in 7IC101 (7IC202) or 10 mV across 7R119 (7R219). When receiver has been on for 10 minutes. with volume control turned down, check no-signal current and again adjust for 25 mA or 10 mV across emitter resistor.



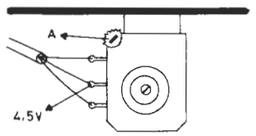
TUNING VOLTAGE

Depress P1 and turn preset potentiometer toward stop in the left side (the low end of the scale).



With 3R6 (assessible from the underside of PC3) adjust to 4.5V in relation to ground.

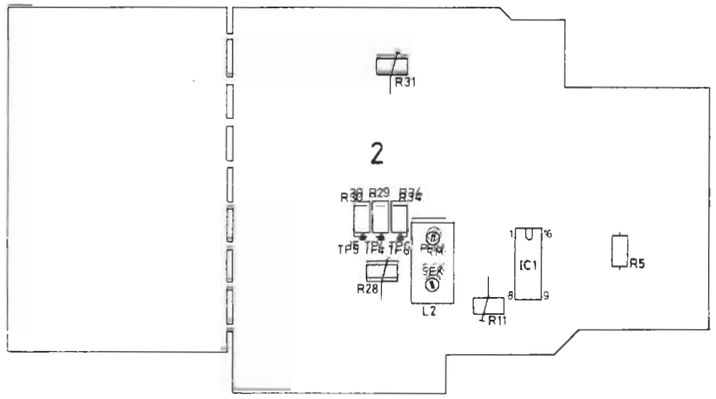
Depress FM and turn dial pointer to the left toward stop.



With potentiometer A adjust to 4.5V in relation to ground.

FM IF AND DETECTOR

Connect sweep generator to aerial input. Set generator to deliver 50 µV aerial input signal at 97 MHz, Δf 0.5 MHz.
Connect oscilloscope:
Y1 to 2TP6 (0.2 V/cm)
Y2 to 2TP4 (0.5 V/cm)
Connect voltmeter between 2TP4 and 5.



IF ADJUSTMENT

Depress FM button and set tuning control to 97 MHz on dial (AFC in "OFF" position).
With 1L7 and 1L8 adjust for max. symmetrical IF curve.

DETECTOR ROUGH ADJUSTMENT

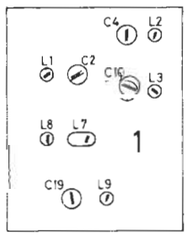
With 2L2 primary adjust "S"-curve for best symmetry.
With 2L2 secondary adjust "S"-curve for best linearity.

DETECTOR FINE ADJUSTMENT

Short 2R5 (at tuner terminal). With "det. bal." 2R28 adjust for 0V between 2TP4 and 5 (≤ ± 10 mV). Remove short.
With 2L2 primary adjust for 0V between 2TP4 and 5.
With 2L2 secondary adjust for max. and linear "S"-curve.

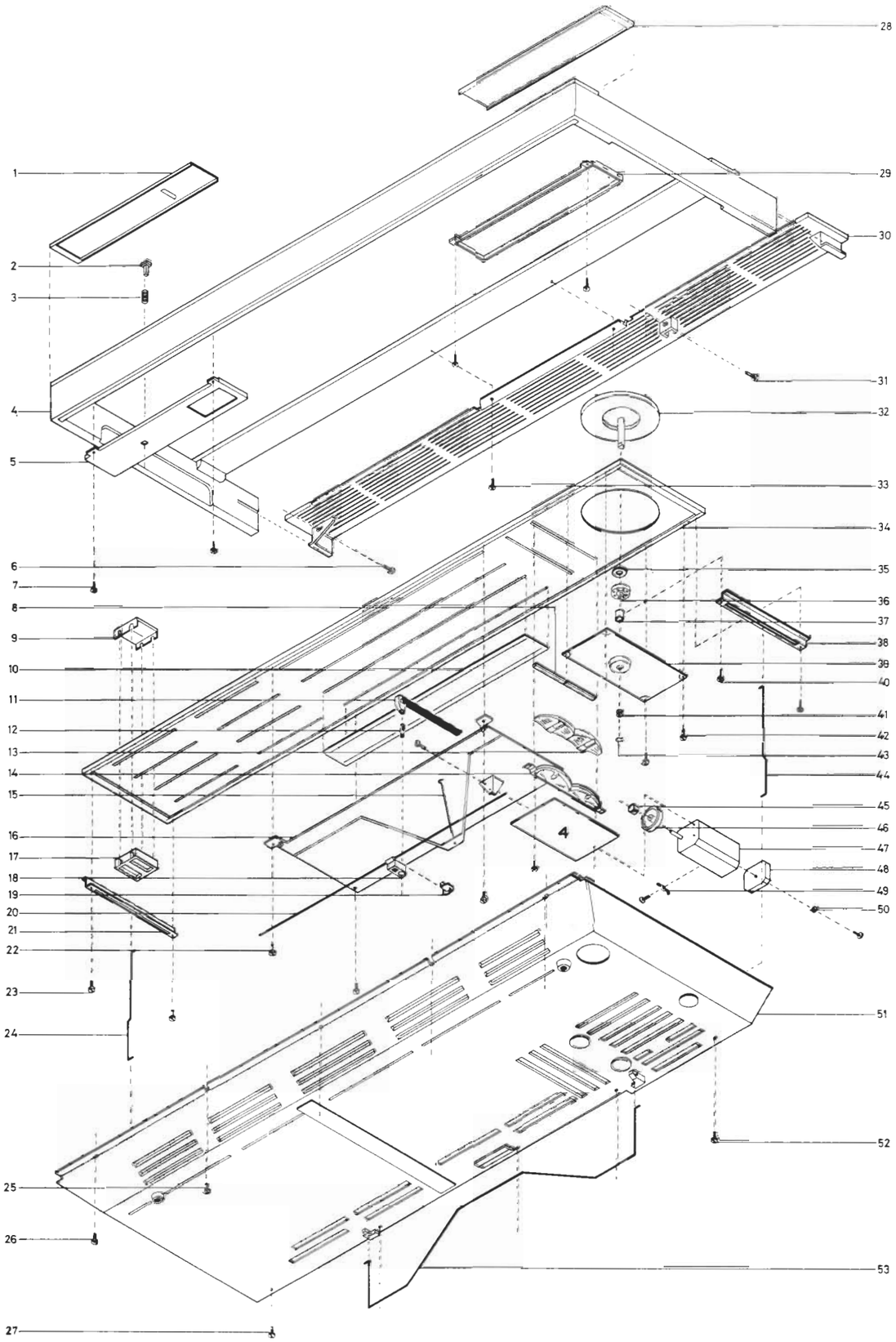
TUNER

Set tuning control to 89.0 MHz on dial.
Set sweep generator to 89.0 MHz.
With 1L1, 2, 3, and 9 adjust for max. IF curve at 2TP6.
Set tuning control to 102 MHz on dial.
Set sweep generator to 102 MHz.
With 1C2, 4, 10 and 19 adjust for max. IF curve at 2TP6.
Check dial alignment - repeat adjustment ~~procedure~~ if necessary.



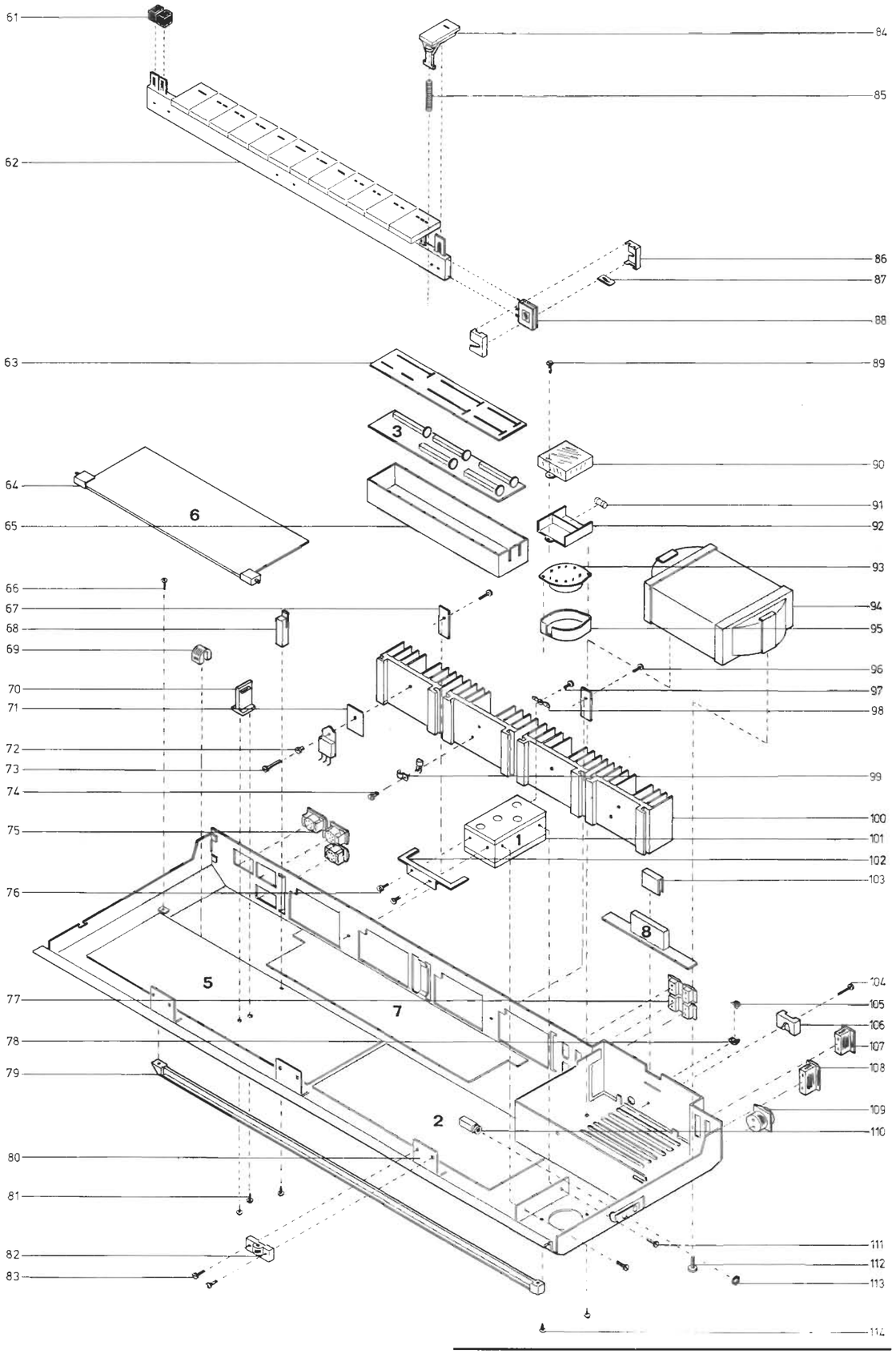
BALANCE LIGHT

Tune in an FM station correctly (0V between 2TP4 and 5).
With 2R31 adjust for identical brilliance of both lamps.



PARTS LIST FOR BEOMASTER 2000, TYPE 2801

1	3168051	Cover, aluminium
	3168053	Cover, black
2	3015048	Locking plate
3	2818036	Spring
4	3412141	Cabinet, teak
	3412143	Cabinet, rosewood
	3412144	Cabinet, oak
	3412145	Cabinet, white
5	3164168	Holder
6	2038926	Screw, black
7	2013200	Screw
8	3370071	Window, green
	3370072	Window, red
9	3190058	Slide pointer
10	3199040	Pointer glass
11	3190059	Pointer
12	8230046	Bulb
13	3370073	Lamp housing
14	3131081	Housing
15	2850070	Arm
16	3300051	Plate
17	3015049	Slide
18	3015056	Slide
19	3164167	Cover
20	2834036	Shaft
21	2542383	Bracket
22	2038208	Screw
23	2038208	Screw
24	3151131	Holder
25	2038208	Screw
26	2038216	Screw
27	2038926	Screw, black
28	3168050	Cover, aluminium
	3168052	Cover, black
29	3152124	Holder
30	3444067	Ventilating grille
31	2038926	Screw, black
32	2794059	Flywheel, aluminium
	2794058	Flywheel, black
33	2013200	Screw
34	3191060	Control panel, aluminium
	3191061	Control panel, black
35	2622234	Washer
36	2900005	Ball bearing
37	2622217	Bushing
38	2542383	Bracket
39	3150040	Bearing bushing
40	2038208	Screw
41	2724032	Cord pulley
42	2038208	Screw
43	2390064	Seeger circlip 5 mm
44	3151131	Holder
45	2395031	Spire
46	2724033	Cord pulley
47	4310011	Variable capacitor
48	5300086	Potentiometer 100 kohms
49	7530013	Solder tag
50	2622110	Washer
51	3454174	Bottom
	3164174	Cover for "Headphones"
52	2038926	Screw, black
53	2514029	Foot

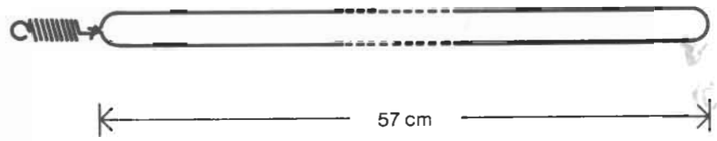


61	2775314	Button, LOUDN
	2775315	Button, TAPE
62	7400123	Switch mounted, aluminium
	7400124	Switch mounted, black
	2775367	Button PHONO
	2775378	Button PHONO, black
	2775368	Button TAPE
	2775379	Button TAPE, black
	2775369	Button MONO
	2775380	Button MONO, black
	2775370	Button LW
	2775381	Button LW, black
	2775371	Button MW
	2775382	Button MW, black
	2775372	Button FM
	2775383	Button FM, black
	2775373	Button P1
	2775384	Button P1, black
	2775374	Button P2
	2775385	Button P2, black
	2775375	Button P3
	2775386	Button P3, black
	2775376	Button P4
	2775387	Button P4, black
	2775377	Button P5
	2775388	Button P5, black
63	3199039	Dial
64	3015044	Holder
65	3152122	Housing
66	2013200	Screw
67	2640029	Clamp
68	2574053	Support
69	2515021	Clamp
70	3150028	Support
71	3170121	Mica sheet
72	2938017	Bushing
73	2038926	Screw
74	2038926	Screw
75	7211049	Socket 5 pol. DIN
76	2038206	Screw
77	7211047	Socket 2 pol.
78	2641062	Locking plate
79	3152123	Holder
80	2530294	Bracket
81	2013201	Screw
82	3015045	Guide plate
83	2038216	Screw
84	2775365	Button OFF
	2775366	Button OFF, black
85	2818037	Spring
86	3164067	Cover
87	3302159	Insulating piece
*88	7450029	Mains switch
90	3164109	Cover
91	6600006	Fuse 1A-T/250 V
92	3131101	Housing
93	7401001	Mains-voltage switch
94	8013127	Mains transformer
95	3131050	Housing
96	2038926	Screw
97	2038206	Screw
98	2510104	Clamp
99	2816105	Clamp
100	3358078	Heat sink
101	8050063	Tuner
102	2548121	Bracket
103	2816114	Clamp
104	2038216	Screw
105	2641061	Locking plate
106	3152006	Holder
107	7211043	Socket AM
108	7211042	Socket FM
109	7211050	Socket 75 ohms
110	7210023	Socket PHONES
111	2038206	Screw
112	2042203	Screw
113	2380092	Nut
114	2013201	Screw

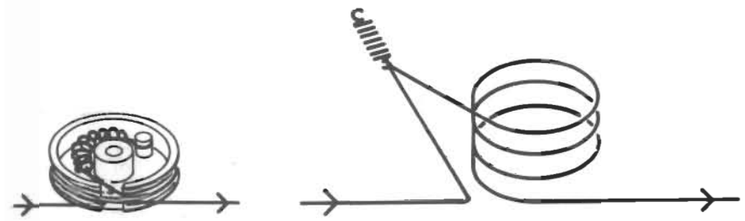
NOT SHOWN PARTS

3955001	Dial cord
2810017	Spring
3391435	Outer carton
3391436	Top/bottom insert
3397204	Foam packing, front
3397205	Foam packing, back
3532099	Instruction diagram

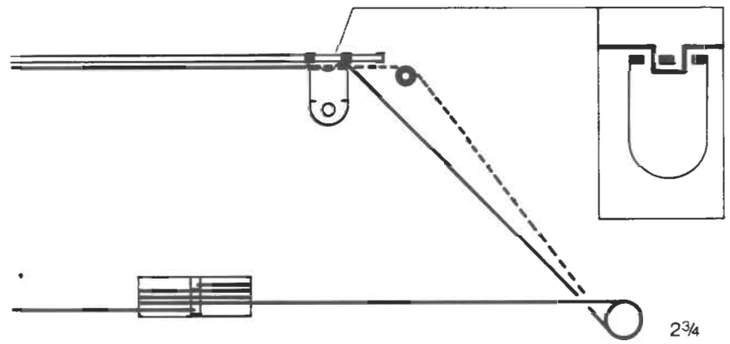
MOUNTING OF DIAL CORD



Dial cord and spring are tied together so that the cord forms a loop. See the sketch.



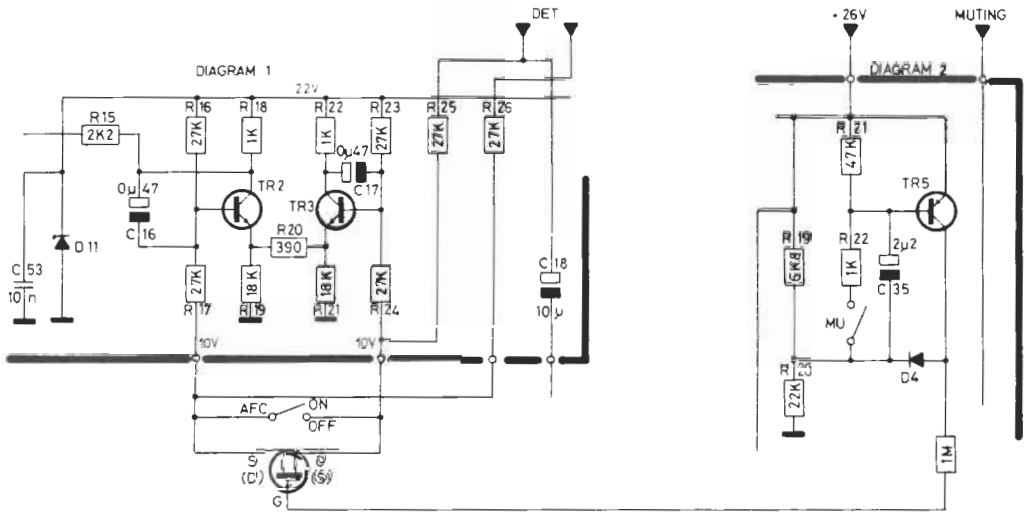
The spring is mounted on the cord pulley. The cord is winded up the pulley as show. The pulley is turned clockwise till stop.



Then the cord is winded 2¾ times round the fly wheel shaft and then round the cord pulley.
Dial wheel is turned from start to stop a couple of times to scatter the cord. The pointer is pushed completely to the right and the pulley is turned clockwise till stop. Slacken the cord and sew it into the needle as shown. The cord is secured by a drop of glue.

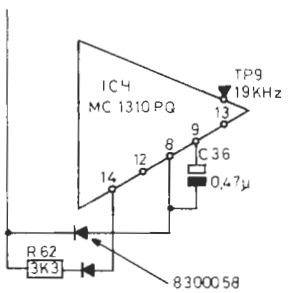
GANG CLOCK WISE HF END

MODIFICATIONS
WRONG LOCKING OF PRE-SET FM STATIONS



This is due to the fact that 2IC1 does not always produce 0 V detector voltage, pin 5 and 6, when the IF signal at the output of the IC is switched off, e.g. when listening AM. If the AFC is connected, the tuning voltage will change according to the detector voltage produced.
When switching back to FM, another station than the pre-set will be received.
To avoid this a FET no. 8320119 is mounted as shown.

STEREOLAMP ACTIVATED BY NOISE



In some receivers the stereo lamp is activated by noise, and is not switched off until a mono station is tuned in.
This is solved by mounting a diode No. 8300058 as shown.

MAINS TRANSFORMATOR

Because of hum, we have constructed a new mains transformer. It has the same number: 8013127.

LEAD FOR DIAL LAMP

In the first produced receivers the lead for the dial lamps was made of an insufficiently soft material.
This is now replaced by a more soft lead, complete with flex and springs, No. 6273734.